PROPOSED ACTION:	Issuance of Incidental Harassment Authorization to SAExploration Inc. for the Take of Marine Mammals Incidental to Seismic Surveys in Cook Inlet, Alaska.
TYPE OF STATEMENT:	Environmental Assessment
LEAD AGENCY:	U.S. Department of Commerce National Oceanic and Atmospheric Administration National Marine Fisheries Service
RESPONSIBLE OFFICIAL:	Donna S. Wieting, Director Office of Protected Resources, National Marine Fisheries Service
FOR FURTHER INFORMATION:	Sara Young National Marine Fisheries Service Office of Protected Resources Permits and Conservation Division 1315 East West Highway Silver Spring, MD 20910 301-427-8484
LOCATION:	Cook Inlet, Alaska.
ABSTRACT:	This Environmental Assessment analyzes the environmental impacts of the National Marine Fisheries Service, Office of Protected Resources proposal to issue an Incidental Harassment Authorization, pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act, to SAExploration Inc. for the take of small numbers of marine mammals incidental to conducting seismic surveys in Cook Inlet, Alaska.
DATE:	May 8, 2015

TABLE OF CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

3D	three dimensional
ADF&G	Alaska Department of Fish and Game
ADCCE	Alaska Department of Commerce, Community, and Economic
ADNR	Alaska Department of Natural Resources
AKRO	Alaska Regional Office
ANO	Alaska Native Organization
Apache	Apache Alaska Corporation
Authorization	Incidental Harassment Authorization
BOEM	Bureau of Ocean Energy Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CIMMC	Cook Inlet Marine Mammal Council
cui	cubic inches
dB re 1 µPa	decibel referenced to one microPascal
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EZ	Exclusion Zone
FONSI	Finding of No Significant Impact
ft	feet
FR	Federal Register
Hz	Hertz
JBER	Joint Base Elmendorf-Fort Richardson
KABATA	Knik Arm Bridge and Toll Authority
km	kilometer
km^2	square kilometer
LOA	Letters of Authorization
m	meter
mi	miles
mi^2	square miles
m^3/sec	cubic meters per second
MHHW	Mean Higher High Water
MMPA	Marine Mammal Protection Act
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service

NMML	National Marine Mammal Laboratory
NOAA	National Oceanic and Atmospheric Administration
OMB	Office of Management and Budget
OPR	Office of Protected Resources
PAM	Passive Acoustic Monitoring
PR1	Permits, Conservation and Educational Division
PRD	Protected Resources Division
PSO	Protected Species Observer
rms	root-mean-squared
SAE	SAExploration Inc.

Chapter 1 Introduction and Purpose and Need

1.1. Description of Proposed Action

The Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1631 *et seq.*) prohibits the incidental taking of marine mammals. The incidental take of a marine mammal falls under three categories: mortality, serious injury, or harassment, which includes injury and behavioral effects. The MMPA defines harassment as any act of pursuit, torment, or annoyance which: (1) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (2) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

There are exceptions, however, to the MMPA's prohibition on take. The National Marine Fisheries Service, Office of Protected Resources, Permits and Conservation Division (NMFS, hereinafter, we) may authorize the incidental taking of small numbers of marine mammals by harassment upon the request of a U.S. citizen provided we follow certain statutory and regulatory procedures and make determinations. We discuss this exception in more detail in section 1.2.

In response to a request from SAExploration Inc. (SAE), we propose to issue an Incidental Harassment Authorization (Authorization) to SAE under section 101(a)(5)(D) of the MMPA, which would allow SAE to take small numbers of marine mammals, incidental to the conduct of oil and gas exploration seismic survey operations in Cook Inlet, Alaska. We do not have the authority to permit, authorize, or prohibit SAE's proposed seismic survey operations under section 101(a)(5)(D) of the MMPA, as that authority lies with a different agency.

Our issuance of an Authorization to SAE would be a major federal action under the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations in 40 CFR §§ 1500-1508, and NOAA Administrative Order (NAO) 216-6. Thus, we are required to analyze the effects on the human environment and determine whether they are significant.

This Environmental Assessment (EA), titled "*Issuance of an Incidental Harassment Authorization to SAExploration Inc. for the Take of Marine Mammals Incidental to Seismic Surveys in Cook Inlet, Alaska*," (hereinafter, SAE EA) addresses the potential environmental impacts of three alternatives available to us under section 101(a)(5)(A) of the MMPA, namely:

- Issue an Authorization to SAE for Level B harassment take of marine mammals under the MMPA during their oil and gas exploration seismic survey program operations, taking into account the prescribed means of take, mitigation measures, and monitoring requirements required in the proposed Authorization;
- Not issue an Authorization to SAE, in which case, for the purposes of NEPA analysis only, we assume that SAE would not conduct their proposed seismic survey program; or
- Issue an Authorization to SAE for Level B harassment take of marine mammals under the MMPA during the activities by incorporating additional required mitigation measures.

1.1.1. Background on SAE's MMPA Application

SAE proposes to conduct oil and gas exploration seismic survey operations in Cook Inlet, Alaska, for one open water season beginning in May 2015. The activity would occur for approximately eight to nine months. SAE has proposed to survey an area of 3,934.7 km^2 with the primary objective to explore for and develop oil and gas resources in Cook Inlet. Seismic surveys are designed to collect bathymetric and sub-seafloor data that allow the evaluation of potential shallow faults, gas zones, and archeological features at prospective exploration drilling locations. Acoustic stimuli generated by the seismic airgun array have the potential cause behavioral disturbances to marine mammals in the proposed project area.

1.1.2. Marine Mammals in the Action Area

The proposed seismic survey program could adversely affect the following marine mammal species under our jurisdiction:

- Humpback whale (*Megaptera noveangliae*)
- Minke whale (*Balaenoptera acutorostra*)
- Cook Inlet beluga whale (*Delphinapterus leucas*)
- Harbor seal (*Phoca vitulina richardsi*)
- Killer whale (*Orcinus orca*)
- Harbor porpoise (*Phocoena phocoena*)
- Dall's porpoise (*Phocoenoides dalli*)
- Gray whale (*Eschrichtius robustus*)
- Steller sea lion (*Eumetopias jubatus*)

1.2. Purpose and Need

The MMPA prohibits "takes" of marine mammals, with a number of specific exceptions. The applicable exception in this case is an authorization for incidental take of marine mammals in section 101(a)(5)(D) of the MMPA.

Section 101(a)(5)(D) of the MMPA directs the Secretary of Commerce (Secretary) to authorize, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if we make certain findings and an Authorization is issued.

We have issued regulations to implement the Incidental Take Authorization provisions of the MMPA (50 CFR Part 216) and have produced Office of Management and Budget (OMB)-approved application instructions (OMB Number 0648-0151) that prescribe the procedures necessary to apply for authorizations. All applicants must comply with the regulations at 50 CFR § 216.104 and submit applications requesting incidental take according to the provisions of the MMPA.

Purpose: The primary purpose of our proposed action is to authorize the take of marine mammals incidental to SAE's proposed seismic survey operations activities. The Authorization, if issued, would exempt SAE from the take prohibitions contained in the MMPA.

To authorize the take of small numbers of marine mammals in accordance with section 101(a)(5)(D) of the MMPA, we must evaluate the best available scientific information to determine whether the take

would have a negligible impact on marine mammals or stocks and not have an unmitigable impact on the availability of affected marine mammal species for certain subsistence uses.

In addition, we must prescribe, where applicable, the permissible methods of taking and other means of effecting the least practicable adverse impact on the species or stocks of marine mammals and their habitat (i.e., mitigation), paying particular attention to rookeries, mating grounds, and other areas of similar significance, and on the availability of the species or stocks of marine mammals for subsistence uses. Authorizations must also include requirements or conditions pertaining to the monitoring and reporting of such taking.

Need: On January 12, 2015, SAE submitted an adequate and complete application demonstrating both the need and potential eligibility for issuance of an Authorization in connection with the activities described in section 1.1.1. We now have a corresponding duty to determine whether and how we can authorize take by Level B harassment incidental to the activities described in SAE's application. Our responsibilities under section 101(a)(5)(D) of the MMPA and its implementing regulations establish and frame the need for this proposed action.

Any alternatives considered under NEPA must meet the agency's statutory and regulatory requirements. Our described purpose and need guide us in developing reasonable alternatives for consideration, including alternative means of mitigating potential adverse effects.

1.3. The Environmental Review Process

NEPA compliance is necessary for all "major" federal actions with the potential to significantly affect the quality of the human environment. Major federal actions include activities fully or partially funded, regulated, conducted, authorized, or approved by a federal agency. Because our promulgation and issuance of subsequent Authorizations would allow for the taking of marine mammals consistent with provisions under the MMPA and incidental to the applicant's activities, we consider this as a major federal action subject to NEPA.

Under the requirements of NAO 216-6 section 6.03(f)(2)(b) for incidental harassment authorizations, we prepared this EA to determine whether the direct, indirect and cumulative impacts related to the issuance of an Incidental Harassment Authorization for incidental take of marine mammals under the MMPA during the conduct of SAE's seismic survey program in Cook Inlet, Alaska, could be significant. If we deem the potential impacts to be not significant, this analysis, in combination with other analyses incorporated by reference, may support the issuance of a Finding of No Significant Impact (FONSI) for the proposed Authorization.

1.3.1. Laws, Regulations, or Other NEPA Analyses Influencing the EA's Scope

We have based the scope of the proposed action and nature of the three alternatives considered in this EA on the relevant requirements in section 101(a)(5)(D) of the MMPA. Thus, our authority under the MMPA bounds the scope of our alternatives. We conclude that this analysis—when combined with the analyses in the following documents—fully describes the impacts associated with the proposed seismic survey program, including any required mitigation and monitoring measures. After conducting an independent review of the information and analyses for sufficiency and adequacy, we incorporate by reference the relevant analyses on SAE's proposed survey as well as a discussion of the affected environment and

environmental consequences within the following documents per 40 CFR 1502.21 and NAO 216-6 § 5.09(d):

- our notice of the proposed Authorization in the *Federal Register* notice (80 FR 14913, March 20, 2015);
- *Application for the Incidental Harassment Authorization for the Taking of Marine Mammals in Conjunction with SAE's Proposed 3D Seismic Surveys in Cook Inlet, Alaska 2015* (Owl Ridge, 2015);
- *BIOLOGICAL ASSESSMENT for SAExploration, Inc. Cook Inlet 3D Seismic Program Cook Inlet, Alaska* (Fairweather Science, 2015);
- *Final Supplemental Environmental Impact Statement—Cook Inlet Beluga Whale Harvest* (NMFS, 2008a);
- *Final Conservation Plan for the Cook Inlet beluga whale (Delphinapterus leucas)* (NMFS, 2008b);
- *Recovery Plan for the Steller sea lion* (*Eumatopia jubatus*) (NMFS, 2008c);

MMPA APPLICATION AND PROPOSED IHA

The CEQ regulations (40 CFR §1502.25) encourage federal agencies to integrate NEPA's environmental review process with other environmental review laws. We rely substantially on the public process for developing proposed Authorizations and evaluating relevant environmental information and provide a meaningful opportunity for public participation as we develop corresponding EAs.

On March 20, 2105, we published a proposed IHA in the *Federal Register* (80 FR 14913), which included the following:

- a detailed description of the proposed action and an assessment of the potential impacts on marine mammals and the availability of marine mammals for subsistence uses;
- plans for SAE's mitigation and monitoring measures to avoid and minimize potential adverse impacts to marine mammals and their habitat and proposed reporting requirements; and
- our preliminary findings under the MMPA.

We considered SAE's proposed mitigation and monitoring measures that would effect the least practicable adverse impact on marine mammals and preliminarily determined that the impact on marine mammals of conducting the proposed oil and gas exploration seismic survey operations in Cook Inlet, Alaska, for an eight month period, would result, at worst, in a modification in behavior and/or low-level physiological effects (Level B harassment) of certain species of marine mammals. In addition, we preliminarily determined that the proposed seismic survey activities would not have an unmitigable adverse impact on the availability of marine mammals for subsistence uses.

Within our notice, we requested that the public submit comments, information, and suggestions concerning SAE's request, the content of our proposed Authorization, and potential environmental effects related to the proposed issuance of the Authorization. This SAE EA incorporates by reference and relies on SAE's application (Owl Ridge, 2015), our notice of a proposed Authorization (80 FR 14913, March 20, 2015), and other environmental analyses (NMFS, 2008a,b,c, 2013a,b) to avoid duplication of analysis and unnecessary length.

In summary, those analyses concluded that with incorporation of monitoring and mitigation measures proposed by SAE, the authorized taking of marine mammals results in minor, short-term (recoverable) adverse effects on individual marine mammals. Next, the Authorization would not result in individually insignificant, but cumulatively significant impacts, or in cumulative adverse effects that could have a substantial effect on the target species or non-target species. The frequency and duration of the harassment from the seismic survey should allow adequate time for the marine mammals to recover from potentially adverse effects. Finally, the analyses concluded that NMFS did not expect that additive or cumulative effects of the seismic survey on its own or in combination with other activities would occur. Finally, the environmental analyses did not identify any significant environmental issues or impacts.

1.3.2. Scope of Environmental Analysis

Given the limited scope of the decision for which we are responsible, this EA provides more focused information on the primary issues and impacts of environmental concern related specifically to our issuance of an Authorization. This EA does not further evaluate effects to the elements of the human environment listed in Table 1 because previous environmental reviews, incorporated by reference (NMFS 2008a,b,c, 2013a,b) have shown that our limited action of issuing Authorizations for similar activities in Cook Inlet or SAE's proposed seismic surveys would not significantly affect those components of the human environment.

Table 1. Components of the human environment not affected by our issuance of an Authorization.

Biological	Physical	Socioeconomic / Cultural
Amphibians	Air Quality	Commercial Fishing
Humans	Essential Fish Habitat	Military Activities
Non-Indigenous Species	Geography	Oil and Gas Activities
Seabirds	Land Use	Recreational Fishing
	Oceanography	Shipping and Boating
	State Marine Protected Areas	National Historic Preservation Sites
	Federal Marine Protected Areas	National Trails and Nationwide Inventory of Rivers
	National Estuarine Research Reserves	Low Income Populations
	National Marine Sanctuaries	Minority Populations
	Park Land	Indigenous Cultural Resources
	Prime Farmlands	Public Health and Safety
	Wetlands	Historic and Cultural Resources
	Wild and Scenic Rivers	
	Ecologically Critical Areas	

1.3.3. NEPA Public Involvement Summary

NAO 216-6 established agency procedures for complying with NEPA and the implementing NEPA regulations issued by the CEQ. Consistent with the intent of NEPA and the clear direction in NAO 216-6 to involve the public in NEPA decision-making, we requested comments on the potential environmental

impacts described in SAE's MMPA application, the proposed Authorization *Federal Register* notice, and this EA. The CEQ regulations further encourage agencies to integrate the NEPA review process with review under the environmental statutes. Consistent with agency practice, we integrated our NEPA review and preparation of this EA with the public process required by the MMPA for the proposed issuance of an Authorization.

The *Federal Register* notice of the proposed Authorization, combined with our preliminary determinations, supporting analyses, and corresponding public comment period are instrumental in providing the public with information on relevant environmental issues and offering the public a meaningful opportunity to provide comments to us for consideration in both the MMPA and NEPA decision-making processes.

The *Federal Register* notice of the proposed Authorization summarized our proposed action; stated that we would prepare an EA for the proposed action; and invited interested parties to submit written comments concerning the application and our preliminary analyses and findings including those relevant to consideration in the EA. The notice of the proposed Authorization was available for public review and comment from March 20, 2015, through April 20, 2015.

This process served the public participation function for this EA in terms of scoping for the action and providing the public a meaningful opportunity to participate in the process. In addition, we posted SAE's application on our website concurrently with the release of the *Federal Register* notice of the proposed Authorization. We base this EA on the information included in our *Federal Register* notice, the documents it references, and the public comments provided in response. At the conclusion of this process, we will post the final EA, and, if appropriate, FONSI, on the same website.

1.3.4. Relevant Comments on Our *Federal Register* Notice

During the 30-day public comment period on the notice of the proposed Authorization, we received four comment letters from the following: the Natural Resources Defense Council (NRDC), on behalf of nine organizations; the Marine Mammal Commission (MMC); Furie Operating Alaska, LLC (Furie); and one private citizen.

In general, the comments focused on aspects of the seismic operations, the analysis of impacts on Cook Inlet beluga whales provided in the application and *Federal Register* notice announcing the proposed Authorization, and some of the proposed mitigation and monitoring measures. Many of the comments were concerned with take estimation, as well as cumulative impacts in Cook Inlet. We have considered the comments regarding monitoring and mitigation measures within the context of the MMPA requirement to effect the least practicable impact on marine mammals and their habitat and on subsistence uses of marine mammals.

We will provide our response to the public comment letters in the *Federal Register* notice announcing our decision on whether to issue the Authorization. We fully considered all of the public comments in preparing a determination on a final Authorization and this EA. Where appropriate, changes to the proposed Authorization that resulted from public comments have been incorporated into this EA.

1.4. Other Consultation Requirements

This section summarizes consultation requirements necessary to implement the proposed action.

1.4.1. Endangered Species Act

Section 7 of the ESA and implementing regulations at 50 CFR §402 require consultation with the appropriate federal agency (either NMFS or the U.S. Fish and Wildlife Service) for federal actions that "may affect" a listed species or critical habitat. NMFS' issuance of an Authorization affecting ESA-listed species or designated critical habitat, directly or indirectly, is a federal action subject to these section 7 consultation requirements. Accordingly, NMFS is required to ensure that its action is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of critical habitat for such species.

There are three marine mammal species under NMFS' jurisdiction listed as endangered under the ESA with confirmed or possible occurrence in the proposed project area (i.e., Cook Inlet): the Cook Inlet beluga whale, the Central North Pacific humpback whale, and the Steller sea lion. Additionally, the proposed action falls within designated critical habitat for the Cook Inlet beluga whale. The NMFS Office of Protected Resources (OPR) Permits and Conservation Division (PR1) consulted with the NMFS Alaska Regional Office (AKRO) Protected Resources Division (PRD) on the proposed issuance of this Authorization under section 101(a)(5)(D) of the MMPA because the action of issuing the Authorization may affect endangered species under NMFS' jurisdiction.

On February 26, 2015, PR1 requested initiation of consultation under section 7 of the ESA regarding the proposed issuance of an Authorization to SAE for the take of marine mammals incidental to conducting oil and gas exploration seismic survey operations in Cook Inlet, Alaska, for a one-year period beginning in May 2015. SAE will also be requesting a federal permit from the Bureau of Ocean Energy (BOEM) to operate in federally leased waters. Therefore, the BOEM requested consultation under section 7 of the ESA jointly with PR1. This consultation will be concluded prior to making a final decision on whether to issue a final Authorization.

1.4.2. Marine Mammal Protection Act

The MMPA and its provisions that pertain to the proposed action are discussed above in section 1.2.

1.4.3. Magnuson-Stevens Fishery Conservation and Management Act

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), Federal agencies are required to consult with the Secretary of Commerce with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency which may adversely affect essential fish habitat (EFH) identified under the MSFCMA. EFH has been identified in Cook Inlet for walleye Pollock, rock sole, Pacific cod, skate, weathervane scallop, Pacific salmon, and sculpin. NMFS' proposed action of authorizing harassment of marine mammals and our proposed mitigation and monitoring do not impact EFH; therefore, an EFH consultation was not conducted.

Chapter 2 Alternatives

2.1. Introduction

The NEPA and the implementing CEQ regulations (40 CFR §§ 1500-1508) require consideration of alternatives to proposed major federal actions, and NAO 216-6 provides agency policy and guidance on the consideration of alternatives to our proposed action. An EA must consider all reasonable alternatives, including the No Action Alternative. This provides a baseline analysis against which we can compare the other alternatives.

To warrant detailed evaluation as a reasonable alternative, an alternative must meet our purpose and need. In this case, as we previously explained, an alternative meets the purpose and need if it satisfies the requirements under section 101(a)(5)(D) the MMPA. We evaluated each potential alternative against these criteria; identified two action alternatives along with the No Action Alternative; and carried these forward for evaluation in this EA.

Alternatives 1 and 3 include a suite of mitigation measures intended to minimize potentially adverse interactions with marine mammals. This chapter describes the alternatives and compares them in terms of their environmental impacts and their achievement of objectives.

2.2. Description of SAE's Proposed Activities

We presented a general overview of SAE's proposed oil and gas exploration seismic survey program operations in our *Federal Register* notice of proposed Authorization (80 FR 14913, March 20, 2015). We incorporate those descriptions by reference in this EA and briefly summarize them here.

2.2.1. Specified Time and Specified Area

SAE proposes to operate in Cook Inlet offshore waters for approximately eight to nine months in open water periods from May 13~~8~~, 2015 through May 12~~7~~, 2016. During each 24-hour period, seismic support activities may be conducted throughout the entire period; however, in-water airguns would only be active for approximately 2-3 hours during each of the slack tide periods. There are approximately four slack tide periods in a 24-hour period; therefore, airgun operations would be active during approximately 8-12 hours per day, if weather conditions allow.

The proposed location of SAE's acquisition plan encompasses approximately 3,943 km^2 (1,522 mi^2) of offshore areas, although SAE plans to only survey a portion of this area spanning 777km^2. A portion of SAE's intended survey area is located in northern Cook Inlet near the Susitna Delta region. SAE would only operate in a small portion of this Delta, near the southern border of beluga Critical Habitat Area 1. There are numerous factors that influence the survey areas, including the geology of the Cook Inlet area, other permitting restrictions (i.e., commercial fishing, Alaska Department of Fish and Game refuges), seismic imaging of leases held by other entities with whom SAE has agreements (e.g., data sharing), overlap of sources and receivers to obtain the necessary seismic imaging data, and general operational restrictions (ice, weather, environmental conditions, marine life activity, etc.). Water depths for the program range from 0-128 m (0-420 ft).

2.2.2. Seismic Survey Operations

During seismic survey operations, vessels would lay and retrieve nodal sensors on the sea floor in periods of low current over a 24-hour period. SAE proposes to use two synchronized vessels. Each source vessel

would be equipped with compressors and 880 cubic inch (in^3) airgun arrays. Additionally, one of the source vessels would be equipped with a 440 in^3 shallow water source array. The two source vessels do not fire the airguns simultaneously; rather, each vessel fires a shot every 16 seconds, leaving 8 seconds between shots. Vessel speeds range from four to five knots. The operation would utilize two source vessels, three cable/nodal deployment and retrieval operations vessels, a mitigation/monitoring vessel, a crew transport vessel, and two bow picker vessels.

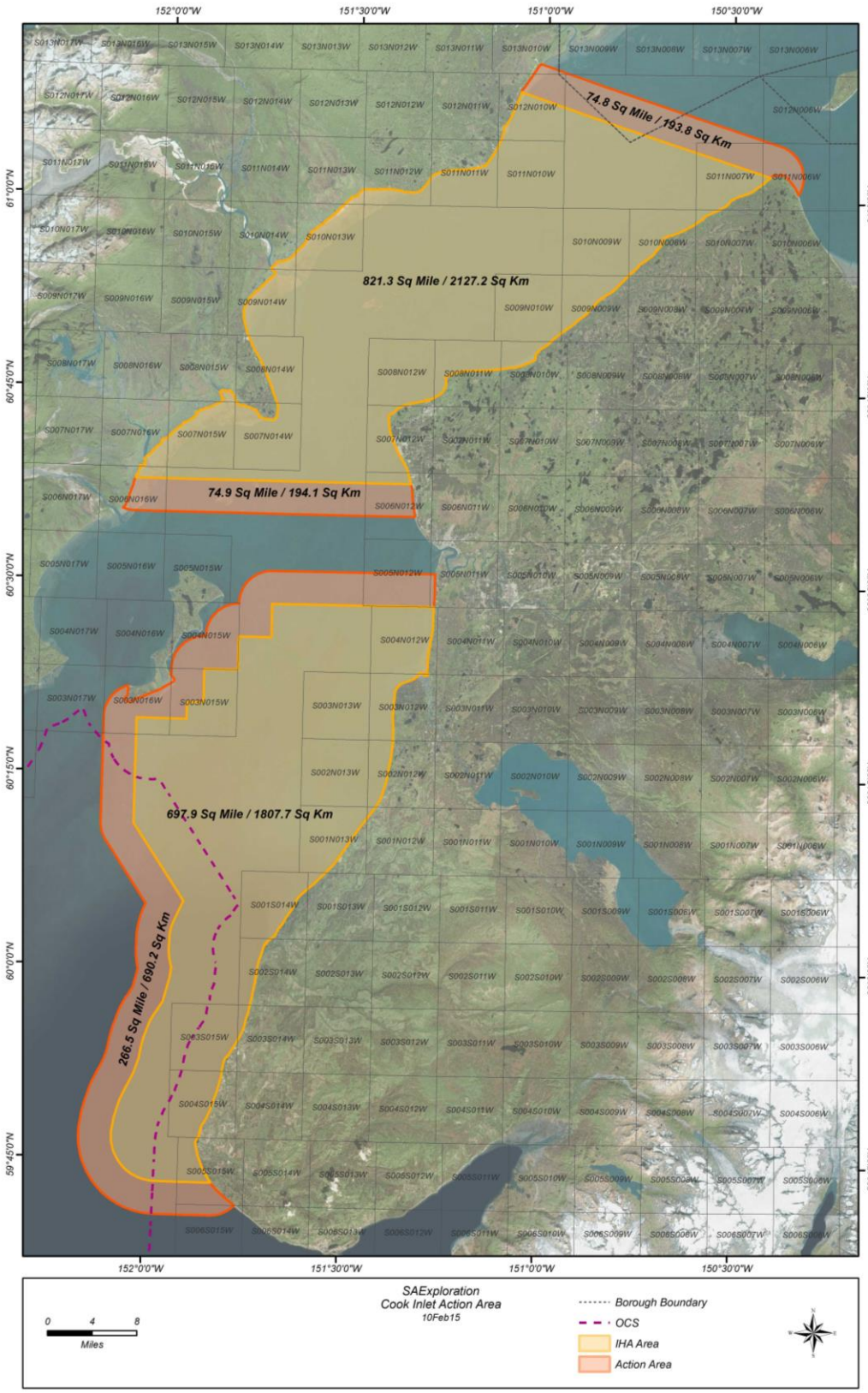

Figure 1. Proposed Project Area for SAE's 2015 3D Seismic Survey

2.3. Description of Alternatives

2.3.1. Alternative 1 – Issuance of Authorizations with Mitigation Measures

The Proposed Action constitutes Alternative 1 and is the Preferred Alternative. Under this alternative, we would issue an Authorization to SAE allowing the incidental take, by Level B harassment, of nine species of marine mammals subject to the mandatory mitigation and monitoring measures and reporting requirements set forth in the proposed IHA, if issued, along with any additions based on consideration of public comments.

MITIGATION AND MONITORING MEASURES

As described in Section 1.2.1, we must prescribe the means of effecting the least practicable adverse impact on the species or stocks of marine mammals and their habitat. In order to do so, we must consider SAE's proposed mitigation measures, as well as other potential measures, and assess how such measures could benefit the affected species or stocks and their habitat. Our evaluation of potential measures includes consideration of the following factors in relation to one another: (1) the manner in which, and the degree to which, we expect the successful implementation of the measures to minimize adverse impacts to marine mammals; (2) the proven or likely efficacy of the measures to minimize adverse impacts as planned; and (3) the practicability of the measures for applicant implementation.

Any additional mitigation measure proposed by us beyond what the applicant proposes should be able to or have a reasonable likelihood of accomplishing or contributing to the accomplishment of one or more of the following goals:

- Avoidance or minimization of marine mammal injury, serious injury, or death wherever possible;
- A reduction in the numbers of marine mammals taken (total number or number at biologically important time or location);
- A reduction in the number of times the activity takes individual marine mammals (total number or number at biologically important time or location);
- A reduction in the intensity of the anticipated takes (either total number or number at biologically important time or location);
- Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base; activities that block or limit passage to or from biologically important areas; permanent destruction of habitat; or temporary destruction/disturbance of habitat during a biologically important time; and
- For monitoring directly related to mitigation, an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

To reduce the potential for disturbance from acoustic stimuli associated with the activities, SAE has proposed to implement several monitoring and mitigation measures for marine mammals. NMFS has proposed some additional measures. The proposed monitoring and mitigation measures include:

(1) Utilize NMFS-qualified, vessel-based Protected Species Observers (PSOs) to visually watch for and monitor marine mammals near the seismic source vessels during daytime operations (from

nautical twilight-dawn to nautical twilight-dusk) and before and during start-ups of sound sources day or night. Two PSOs would be on each source vessel, and two PSOs would be on the support vessel to observe the exclusion and disturbance zones. When practicable, as an additional means of visual observation, SAE's vessel crew may also assist in detecting marine mammals.

(2) In addition to the vessel-based PSOs, utilize a shore-based station to visually monitor for marine mammals when operations are close to shore. The shore-based PSOs would scan the area prior to, during, and after the survey operations involving the use of sound sources, and would be in contact with the vessel-based PSOs via radio to communicate sightings of marine mammals approaching or within the project area.

(3) Establish a 180 dB re 1 µPa (rms) and 190 dB re 1 µPa (rms) "exclusion zone" (EZ) for marine mammals before the full array (880 in^3) is in operation; and a 180 dB re 1 µPa (rms) and 190 dB re 1 µPa (rms) EZ before a single airgun (10 in^3) is in operation, respectively. SAE must also establish a 160 dB re 1 µPa (rms) zone for belugas and groups of five or more harbor porpoises and/or killer whales before the full array (880 in^3) and before a single airgun (10 in^3) is in operation.

(4) Visually observe the entire extent of the EZ (180 dB re 1 µPa [rms] for cetaceans and 190 dB re 1 µPa [rms] for pinnipeds and the 160 dB re 1 µPa [rms] for belugas and groups of five or more harbor porpoises and/or killer whales) using NMFS-qualified PSOs, for at least 30 minutes (min) prior to starting the airgun array (day or night). If the PSO finds a marine mammal within the EZ, SAE must delay the seismic survey until the marine mammal(s) has left the area. If the PSO sees a marine mammal that surfaces, then dives below the surface, the PSO shall wait 30 min. If the PSO sees no marine mammals during that time, they should assume that the animal has moved beyond the EZ. If for any reason the entire radius cannot be seen for the entire 30 min (i.e., rough seas, fog, darkness), or if marine mammals are near, approaching, or in the EZ, the airguns may not be ramped-up.

(5) PSOs must also visually observe the entire extent of the EZ (180 dB re 1 µPa [rms] for cetaceans and 190 dB re 1 µPa [rms] for pinnipeds and the 160 dB re 1 µPa [rms] for belugas and groups of five or more harbor porpoises and killer whales) using NMFS-qualified PSOs, for at least 30 minutes (min) after shutting down the airgun array to note the presence and behavior of any marine mammals after the end of a period of survey activity.

(6) Implement a "ramp-up" procedure when starting up at the beginning of seismic operations or any time after the entire array has been shut down for more than 10 min, which means start the smallest sound source first and add sound sources in a sequence such that the source level of the array shall increase in steps not exceeding approximately 6 dB per 5-min period. During ramp-up, the PSOs shall monitor the EZ, and if marine mammals are sighted, a power-down, or shutdown shall be implemented as though the full array were operational. Therefore, initiation of ramp-up procedures from shutdown requires that the PSOs be able to visually observe the full EZ as described above.

(7) Alter speed or course during seismic operations if a marine mammal, based on its position and relative motion, appears likely to enter the relevant EZ. If speed or course alteration is not safe or practicable, or if after alteration the marine mammal still appears likely to enter the EZ, further mitigation measures, such as a power-down or shutdown, shall be taken.

(8) Power-down or shutdown the sound source(s) if a marine mammal is detected within, approaches, or enters the relevant EZ. A shutdown means all operating sound sources are shut down (i.e.,

turned off). A power-down means reducing the number of operating sound sources to a single operating 10 in^3 airgun, which reduces the EZ to the degree that the animal(s) is no longer in or about to enter it.

(9) Following a power-down, if the marine mammal approaches the smaller designated EZ, the sound sources must then be completely shut down. Seismic survey activity shall not resume until the PSO has visually observed the marine mammal(s) exiting the EZ and is not likely to return, or has not been seen within the EZ for 15 min for species with shorter dive durations (small odontocetes and pinnipeds) or 30 min for species with longer dive durations (large odontocetes, including killer whales and beluga whales).

(10) Following a power-down or shutdown and subsequent animal departure, survey operations may resume following ramp-up procedures described above.

(11) Marine geophysical surveys may continue into night and low-light hours if such segment(s) of the survey is initiated when the entire relevant EZs can be effectively monitored visually (i.e., PSO(s) must be able to see the extent of the entire relevant EZ).

(12) No initiation of survey operations involving the use of sound sources is permitted from a shutdown position at night or during low-light hours (such as in dense fog or heavy rain).

(13) If a beluga whale or groups of five or more killer whales and/or harbor porpoises are visually sighted approaching or within the 160-dB disturbance zone, survey activity would not commence until the animals are no longer present within the 160-dB disturbance zone.

(14) Whenever beluga whales or groups of five or more killer whales and/or harbor porpoises are detected approaching or within the 160-dB disturbance zone, the airguns may be powered down before the animal is within the 160-dB disturbance zone, as an alternative to a complete shutdown. If a power down is not sufficient, the sound source(s) shall be shut-down until the animals are no longer present within the 160-dB zone.

(15) Seismic survey operations involving the use of air guns and pingers must cease if authorized numbers of takes of any marine mammal are met or exceeded.

In addition to the mitigation measures proposed by SAE, we have proposed the following additional mitigation measures:

(1) Suspending seismic operations if a live marine mammal stranding is reported in Cook Inlet coincident to, or within 72 hours of seismic survey activities involving the use of airguns. The shutdown must occur if the animal is within a distance two times that of the 160 dB isopleth of the largest airgun array configuration. Shutdown procedures will remain in effect until NMFS determines that, and advises SAE that, all live animals involved in the stranding have left the area (either of their own volition or following herding by responders).

(2) The mitigation airgun will be operated at approximately one shot per minute and will not be operated for longer than three hours in duration during daylight hours and good visibility. In cases when the next start-up after a turn is expected to be during lowlight or low visibility, use of the mitigation airgun may be initiated 30 minutes before darkness or low visibility conditions occur and may be operated until the start of the next seismic acquisition line. The mitigation gun must still be operated at approximately one shot per minute.

(3) SAE must not operate airguns within 10 miles (16 km) of the mean higher high water (MHHW) line of the Susitna Delta (Beluga River to the Little Susitna River) between April 15 and October 15 (to avoid any effects to belugas in an important feeding and breeding area).
(4) If any marine mammal species are encountered during seismic activities for which take is not authorized and are likely to be exposed to sound pressure levels (SPLs) greater than or equal to 160 dB re 1 µPa (rms), then SAE must alter speed or course, power down or shut-down the sound source to avoid take.

SAE proposes to sponsor marine mammal monitoring during the present project, in order to implement the mitigation measures that require real-time monitoring and to satisfy the monitoring requirements of the Authorization. SAE would monitor the area for marine mammals during all activities. Monitoring would be conducted from vessels and occasionally from shore-based stations. Monitoring data would include the following:

(1) Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from seismic vessel, sighting cue, apparent reaction to the airguns or vessel (e.g., none, avoidance, approach, paralleling, etc., and including responses to ramp-up), and behavioral pace; and
(2) Time, location, heading, speed, activity of the vessel (including number of airguns operating and whether in state of ramp-up or power-down), Beaufort sea state and wind force, visibility, and sun glare. These data shall also be recorded at the start and end of each observation watch and during a watch whenever there is a change in one or more of the variables.

In 2012, another Cook Inlet seismic applicant, Apache, was required to conduct passive acoustic monitoring (PAM) during survey operations. However, for reasons explained here, PAM was not considered practicable to require under this proposed Authorization. The passive acoustic monitoring plan for Apache's 2012 survey anticipated the use of a bottom-mounted telemetry buoy to broadcast acoustic measurements using a radio-system link back to a monitoring vessel. Although a buoy was deployed during the first week of surveying under the 2012 Authorization, it was not successful. Upon deployment, the buoy immediately turned upside down due to the strong current in Cook Inlet. After retrieval, the buoy was not redeployed and the survey used a single omni-directional hydrophone lowered from the side of the mitigation vessel. During the entire 2012 survey season, Apache's PAM equipment yielded only six confirmed marine mammal detections, one of which was a Cook Inlet beluga whale

Additionally, Joint Base Elmendorf-Fort Richardson (JBER), National Marine Mammal Laboratory (NMML), and Alaska Department of Fish & Game (ADF&G) conducted a 2012 study (Gillespie et al. 2013) to determine if beluga whale observations at the mouth of Eagle River corresponded with acoustic detections received by a PAMBuoy data collection system. The PAMBuoy data collection system was deployed in the mouth of Eagle River from 12-31 August 2012. This study was a trial period conducted with one hydrophone at the mouth of the river. Overall, it was successful in detecting beluga whale echolocation clicks and whistles, but came with several limitations:

- The PAM system was able to reliably detect all whales approaching or entering the river but still performs less well than a human observer;

- Sounds from vessels in Cook Inlet (e.g. vessel noise) have a large chance of interfering with detections from PAM. The mouth of Eagle River has very little vessel traffic, which is likely why the study was successful there and not likely to be successful in Cook Inlet;
- PAMbouys could be a navigational hazard in Cook Inlet for commercial, subsistence, and sport fishing, as well as the commercial vessel traffic traveling thorough Cook Inlet;
- The limited testing in a very small area should not become the new standard of monitoring in the entire Cook Inlet. The tide, vessel traffic, bathymetry, and substrate of Cook Inlet are far more complex than the study area;
- It appears the hydrophone must be hardwired to the shore which is not practical for mobile marine seismic operations;
- Currently, deployment of the system is done by walking tripods onto the mudflats. This is not feasible for the vast majority of the SAE project area. Walking onto the mudflats in parts of Cook Inlet also poses a human safety risk due to very soft sediments and a large tidal range;
- The study found considerable investment would be necessary to develop an ice and debris proof mounting system. Other issues with hydrophone configuration include: at extreme low tides, the hydrophone was uncovered and therefore not usable; the hydrophone had to be located in such a position so that it could be occasionally visually inspected; hydrophone battery supply has to constantly be checked; the costs and practicalities of long-term hydrophone mounting and data transmission have not been determined; and only one hydrophone was tested, and SAE would need several hydrophones;
- Observer sightings and acoustic detections of belugas generally corresponded with one another. Thus PAMBuoys would be simply duplicating PSO and shore-basedefforts;
- The wireless modem that transmits the acoustic data to the "base station" was only tested to 3.2 km; and
- The study did not conclude anything about the detection range of the system, except that it was greater than 400 m.

Therefore, given the limited capability of various PAM methodologies for SAE's project in Cook Inlet (see Austin and Zeddies, 2012 for more information), as compared to visual monitoring methods, including shore-based monitoring, the bottom-mounted telemetry buoy and omni-directional hydrophone are no longer considered practicable, and are not proposed to be a component of the 2015 seismic survey.

REPORTING MEASURES

SAE would submit a weekly field report, no later than close of business each Thursday during the weeks when in-water seismic survey activities take place. The weekly field reports would summarize species detected (number, location, distance from seismic vessel, behavior), in-water activity occurring at the time of the sighting (discharge volume of array at time of sighting, seismic activity at time of sighting, visual plots of sightings, and number of power downs and shutdowns), behavioral reactions to in-water activities, and the number of marine mammals exposed. Additionally, SAE would submit a monthly report, no later than the 15th of each month, to NMFS' Permits and Conservation Division for all months during which in-water seismic survey activities occur. These reports must contain and summarize the following information:

(1) Dates, times, locations, heading, speed, weather, sea conditions (including Beaufort sea state and wind force), and associated activities during all seismic operations and marine mammal sightings;

(2) Species, number, location, distance from the vessel, and behavior of any marine mammals, as well as associated seismic activity (number of power-downs and shutdowns), observed throughout all monitoring activities;
(3) An estimate of the number (by species) of: (A) pinnipeds that have been exposed to the seismic activity (based on visual observation) at received levels greater than or equal to 160 dB re 1 µPa (rms) and/or 190 dB re 1 µPa (rms) with a discussion of any specific behaviors those individuals exhibited; and (B) cetaceans that have been exposed to the seismic activity (based on visual observation) at received levels greater than or equal to 160 dB re 1 µPa (rms) and/or 180 dB re 1 µPa (rms) with a discussion of any specific behaviors those individuals exhibited; and
(4) A description of the implementation and effectiveness of the: (A) terms and conditions of the Biological Opinion's Incidental Take Statement (ITS); and (B) mitigation measures of the Authorization. For the Biological Opinion, the report shall confirm the implementation of each Term and Condition, as well as any conservation recommendations, and describe their effectiveness, for minimizing the adverse effects of the action on ESA-listed marine mammals.

SAE would submit an annual report to NMFS' Permits and Conservation Division within 90 days after the end of the operating season. The annual report would include:

(1) Summaries of monitoring effort (e.g., total hours, total distances, and marine mammal distribution through the study period, accounting for sea state and other factors affecting visibility and detectability of marine mammals);
(2) Analyses of the effects of various factors influencing detectability of marine mammals (e.g., sea state, number of observers, and fog/glare);
(3) Species composition, occurrence, and distribution of marine mammal sightings, including date, water depth, numbers, age/size/gender categories (if determinable), group sizes, and ice cover;
(4) Analyses of the effects of survey operations; and
(5) Sighting rates of marine mammals during periods with and without seismic survey activities (and other variables that could affect detectability), such as: (A) initial sighting distances versus survey activity state; (B) closest point of approach versus survey activity state; (C) observed behaviors and types of movements versus survey activity state; (D) numbers of sightings/individuals seen versus survey activity state; (E) distribution around the source vessels versus survey activity state; and (F) estimates of take by Level B harassment based on presence in the 160 dB harassment zone.

NMFS would review the draft annual reports. SAE must then submit a final annual report to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, within 30 days after receiving comments from NMFS on the draft annual report. If NMFS decides that the draft annual report needs no comments, the draft report shall be considered to be the final report.

In addition to these formal reports, SAE must immediately report to NMFS if a total of 25 belugas have been detected within the 160 dB re 1 µPa (rms) disturbance zone during seismic survey operations to allow NMFS to consider making necessary adjustments to monitoring and mitigation.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this Authorization, such as an injury (Level A harassment), serious injury or

mortality (e.g., ship-strike, gear interaction, and/or entanglement), SAE shall immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, her designees, and the Alaska Regional Stranding Coordinators. The report must include the following information:

(1) Time, date, and location (latitude/longitude) of the incident;
(2) The name and type of vessel involved;
(3) The vessel's speed during and leading up to the incident;
(4) Description of the incident;
(5) Status of all sound source use in the 24 hours preceding the incident;
(6) Water depth;
(7) Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);
(8) Description of marine mammal observations in the 24 hours preceding the incident;
(9) Species identification or description of the animal(s) involved;
(10) The fate of the animal(s); and
(11) Photographs or video footage of the animal (if equipment is available).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with SAE to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. SAE may not resume their activities until notified by NMFS via letter or email, or telephone.

In the event that SAE discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition as described in the next paragraph), SAE would immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, her designees, and the NMFS Alaska Stranding Hotline. The report must include the same information identified in the paragraph above. Activities may continue while NMFS reviews the circumstances of the incident. NMFS would work with SAE to determine whether modifications in the activities are appropriate.

In the event that SAE discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the authorized activities (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), SAE shall report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, her designees, the NMFS Alaska Stranding Hotline, and the Alaska Regional Stranding Coordinators within 24 hours of the discovery. SAE shall provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network. Activities may continue while NMFS reviews the circumstances of the incident.

In our *Federal Register* notice of proposed Authorization, which we incorporate by reference, we preliminarily determined that the measures included in the proposed Authorization were sufficient to reduce the effects of SAE's proposed seismic survey operations on marine mammals to the level of least practicable adverse impact. In addition, we described our analysis of impacts and preliminarily determined that the taking of small numbers of marine mammals, incidental to SAE's proposed seismic

survey operations would have a negligible impact on the relevant species or stocks and would not have an unmitgable adverse impact on affected species or stocks for taking for subsistence uses.

Based on public comments received, we have included one additional mitigation measure of a 30 minute post-activity monitoring period that was not included in the proposed Authorization. However, we have not received any information that would cause us to change our preliminary determinations under the MMPA. Accordingly, this Preferred Alternative would satisfy the purpose and need of our proposed action under the MMPA–issuance of an Authorization, along with required mitigation measures and monitoring that meets the standards set forth in section 101(a)(5)(D) of the MMPA and the implementing regulations.

2.3.2. Alternative 2 – No Action Alternative

We are required to evaluate the No Action Alternative per CEQ NEPA regulations. The No Action Alternative serves as a baseline against which to compare the impacts of the Preferred and other alternatives. Under the No Action Alternative, we would not issue an Authorization under the MMPA.

For the purpose of NEPA analysis, we assume that if we do not authorize incidental take, that SAE would not conduct the seismic survey. If the survey is not conducted, the "No Action" alternative would result in no disturbance to marine mammals because of the absence of the proposed activities. The No Action Alternative is not considered a reasonable alternative because it does not meet the purpose and need for the Proposed Action; however, per CEQ regulations it is included and carried forward for analysis.

2.3.3. Alternative 3—Issuance of Authorizations with Additional Mitigation and Monitoring Measures

Under Alternative 3, NMFS would issue an Authorization under section 101(a)(5)(D) of the MMPA to SAE allowing the incidental take, by Level B harassment, of nine species of marine mammals incidental to conducting seismic survey activities in the upper Cook Inlet during the effective period of Authorization. While all of the mitigation, monitoring, and reporting measures that would be required under Alternative 1 would also be required under Alternative 3, the difference under this alternative is that additional mitigation and monitoring measures would be required. Additional measures that would be required by NMFS under this alternative include: a 120-dB monitoring (and safety) zone for beluga whale cow/calf pairs in Cook Inlet; active acoustic monitoring; and the use of unmanned aerial vehicles to conduct aerial monitoring. At this time, these technologies are still being developed or refined. For example, while there has been some testing of unmanned aerial vehicles conducted recently, the technology has not yet been proven effective for monitoring or mitigation as would be required under an Authorization. It is also not feasible to visually observe the 120dB zone from aboard a vessel due to the large distance it encompasses. However, once the monitoring technologies are either developed or refined, they may allow for increased effectiveness in implementing mitigation measures (e.g., shutdown), which would reduce potential impacts to marine mammals even further.

2.4. Alternatives Considered but Eliminated from Further Consideration

NMFS considered whether other alternatives could meet the purpose and need and support SAE's proposed activities. An alternative that would allow for the issuance of an Authorization with no required mitigation or monitoring was considered but eliminated from consideration, as it would not be in compliance with the MMPA and therefore would not meet the purpose and need. For that reason, this

alternative is not analyzed further in this document. In addition, an alternative that would have included time/area restrictions beyond the one already considered in Alternatives 1 and 3 in the Susitna Delta was considered but eliminated from consideration because such measures were unnecessary given the timing and location of the seismic survey.

Chapter 3 Affected Environment

This chapter describes existing conditions in the proposed action area. Complete descriptions of the physical, biological, and social environment of the action area are contained in the documents listed in Section 1.3.1 of this EA. We incorporate those descriptions by reference and briefly summarize or supplement the relevant sections for marine mammals in the following subchapters.

3.1. Physical Environment

We are required to consider impacts to the physical environment under NAO 216-6. As discussed in Chapter 1, our proposed action and alternatives relate only to the authorization of incidental take of marine mammals and not to the physical environment. Certain aspects of the physical environment are not relevant to our proposed action (see subchapter 1.3.2 - Scope of Environmental Analysis). Because of the requirements of NAO 216-6, we briefly summarize the physical components of the environment of relevance here.

3.1.1. Marine Mammal Habitat

We presented information on marine mammal habitat and the potential impacts to marine mammal habitat in the proposed IHA *Federal Register* notice. In summary, beluga whales, harbor porpoise, and harbor seals use the waters of Cook Inlet for foraging, calving, and other important life history functions. The mouths of river streams are important beluga whale feeding habitat. Harbor seals also use coastal haul-outs in Cook Inlet. Killer whales, humpback whales, gray whales, and Steller sea lions more commonly use the lower Cook Inlet area, which is outside the majority of the active seismic operations area. Dall's porpoise and minke whale are sighted infrequently in Cook Inlet.

Pursuant to the ESA, critical habitat has been designated for Cook Inlet beluga whales and Steller sea lions. The proposed action falls within critical habitat designated in Cook Inlet for beluga whales but is not within critical habitat designated for Steller sea lions. On April 11, 2011, NMFS announced two areas (Areas 1 and 2) of beluga whale critical habitat (76 FR 20180) comprising 7,800 km^2 (3,013 mi^2) of marine and estuarine habitat in Cook Inlet[1](Figure 2). Designated beluga whale Critical Habitat Area 1 consists of 1,909 km^2 of Cook Inlet, north of Three Mile Creek and Point Possession. Critical Habitat Area 1 contains shallow tidal flats or mudflats and mouths of rivers that provide important areas for foraging, calving, molting, and escape from predators. High concentrations of beluga whales are often observed in these areas from spring through fall. Additionally, anthropogenic threats have the greatest potential to adversely impact beluga whales and their habitat in Critical Habitat Area 1. Critical Habitat Area 2 consists of 5,891 km^2 located south of Critical Habitat Area 1 and includes nearshore areas along western Cook Inlet and Kachemak Bay. Critical Habitat Area 2 is known fall and winter foraging and transit habitat for beluga whales, as well as spring and summer habitat for smaller concentrations of beluga whales. SAE's proposed oil and gas exploration seismic operations area is 3,934 km^2, of which only a smaller portion would actually be surveyed over an eight to nine month period. None of SAE's proposed seismic survey area is in the designated beluga whale Critical Habitat Area 1, although some of the survey area is within a 10 mile seasonal buffer for Critical Habitat 1. A portion of the lower inlet section of the proposed survey is in the designated beluga whale Critical Habitat Area 2.

[1] For national security reasons, critical habitat excludes all property and waters of JBER and waters adjacent to the Port of Anchorage (Figure 2 Insert).

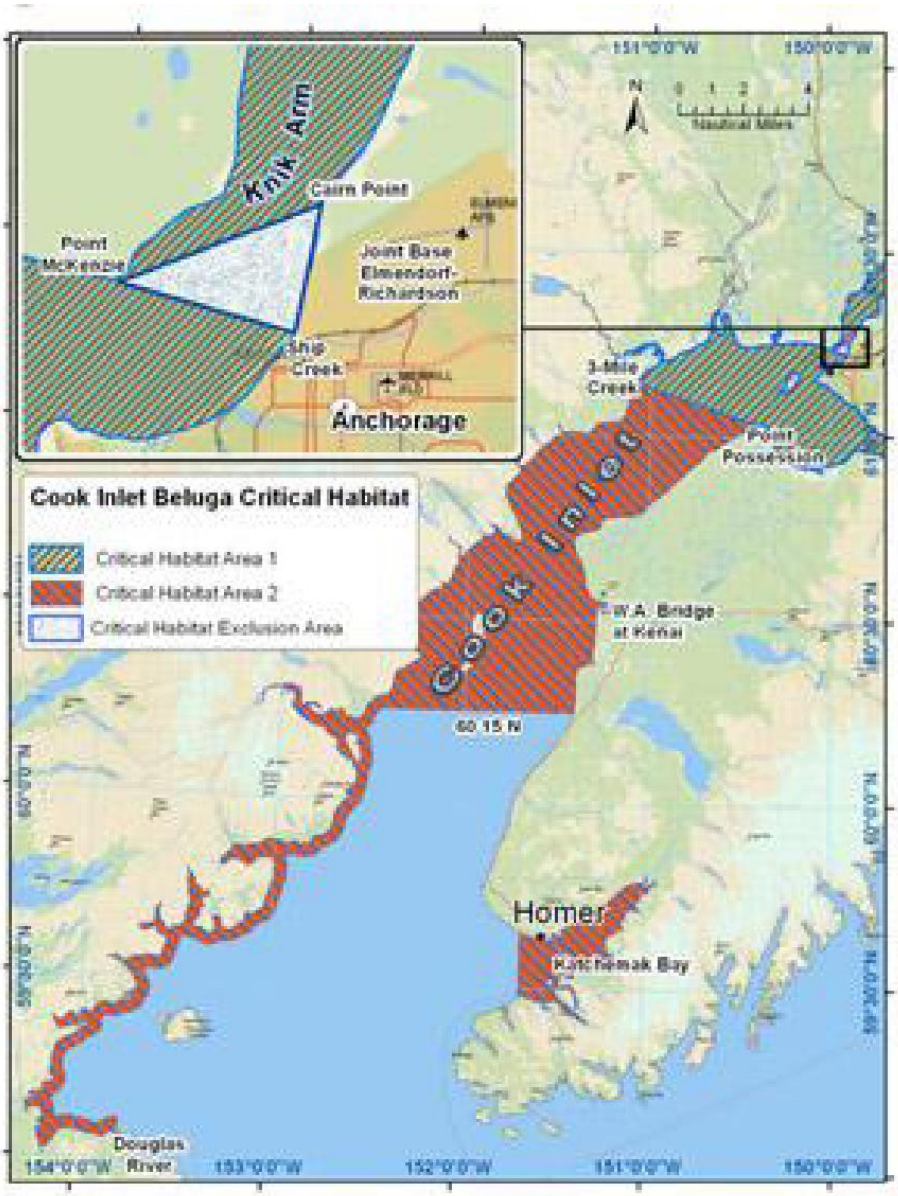

Figure 2. Final critical habitat of Cook Inlet beluga whales (76 FR 20180, April 11, 2011).

3.2. Biological Environment

3.2.1. Marine Mammals

We provide information on the occurrence of marine mammals most likely present in the proposed seismic survey area in section 1.1.2 of this EA. The marine mammals most likely to be harassed incidental to conducting the seismic survey program are: Cook Inlet beluga whale, harbor seal, killer whale, harbor porpoise, humpback whale, gray whale, minke whale, Dall's porpoise, and Steller sea lion (Shelden et al. 2003). While killer and gray whales and Steller sea lions have been sighted in upper Cook Inlet, their occurrence is considered rare. Cook Inlet beluga whales, harbor porpoises, and harbor seals are the species most likely to be sighted during the seismic program. Recent passive acoustic monitoring research has indicated that harbor porpoises occur more frequently in the project area than was previously

estimated based solely on visual observations (NMML 2011, personal communication). Table 2 provides a summary of the abundance and status of the species likely to occur in the seismic survey operations area. We provided information on the distribution, population size, and conservation status for each species in the proposed IHA *Federal Register* notice, and we incorporate those descriptions by reference here. We briefly summarize this information here. The proposed IHA *Federal Register* notice, SAE's application (Owl Ridge, 2015) and the Biological Assessment (Fairweather Science, 2015) contain detailed information on life history functions, hearing abilities, and distribution, which is also incorporated by reference and briefly summarized below. Table 3 provides information on hearing ranges of marine mammals.

Table 2. Abundance estimates, conservation status, and population trends of the marine mammal species for which take is proposed to be authorized.

Species	Stock	ESA/MMPA status[1]; Strategic (Y/N)	Stock abundance (CV, N_{min}, most recent abundance survey)[2]	Relative occurrence in Cook Inlet; season of occurrence
Humpback whale	Central North Pacific	E/D;Y	7,469 (0.095;5,833;2000)	Occasionally seen in Lower Inlet, summer
Minke whale	Alaska	-;N	1,233 (0.034;N/A;2003)	Infrequently occur but reported year-round
Gray whale	Eastern North Pacific	-; N	19,126 (0.071; 18,017; 2007)	Rare migratory visitor; late winter
Killer whale	Alaska Resident Alaska Transient	-;N -:N	2,347 (N/A; 2,084; 2009) 345 (N/A; 303; 2003)	Occasionally sighted in Lowe Cook Inlet
Beluga whale	Cook Inlet	E/D;Y	312 (0.10; 280; 2012)	Use upper Inlet in summer and lower in winter: annual
Harbor porpoise	Gulf of Alaska	-;Y	31,046 (0.214; 25,987; 1998)	Widespread in the Inlet: annual (less in winter)
Dall's porpoise	Alaska			Infrequently found in Lower Inlet
Steller sea lion	Western DPS	E/D;Y	79,300 (N/A; 45,659; 2012)	Primarily found in lower Inlet
Harbor seal	Cook Inlet/Shelikof	-;N	22,900 (0.053; 21,896; 2006)	Frequently found in upper and lower inlet; annual (more in northern Inlet in summer)

Table 3. Classification of marine mammals that could potentially occur in the proposed exploratory drilling site and for which take is proposed to be authorized by functional hearing groups (Southall et al. 2007; NMFS 2013c).

Low Frequency Hearing Range	Gray, minke, and humpback whales

(7 Hz to 30 kHz)	
Mid-Frequency Hearing Range (150 Hz to 160 kHz)	Killer and beluga whales
High Frequency Hearing Range (200 Hz to 180 kHz)	Dall's and harbor porpoise
Phocid in Water Hearing Range (75 Hz to 100 kHz)	Harbor seal
Otariid in Water Hearing Range (100 Hz to 40 kHZ)	Steller sea lion

3.2.2. ESA-listed Marine Mammals

Cook Inlet Beluga Whale

Beluga whales appear seasonally throughout Alaskan waters, except in the Southeast region and the Aleutian Islands. Five stocks are recognized in Alaska: Beaufort Sea stock, eastern Chukchi Sea stock, eastern Bering Sea stock, Bristol Bay stock, and Cook Inlet stock (Allen and Angliss 2013). The Cook Inlet stock is the most isolated of the five stocks, as it is separated from the others by the Alaska Peninsula and resides year round in Cook Inlet (Laidre et al. 2000). Only the Cook Inlet stock inhabits the project oil and gas exploration seismic survey operations area.

NMFS began comprehensive, systematic aerial surveys on beluga whales in Cook Inlet in 1994. Unlike previous efforts, these surveys included the upper, middle, and lower inlet. These surveys documented a decline in abundance of nearly 50 percent between 1994 and 1998, from an estimate of 653 to 347 whales (Rugh et al. 2000). In response to this decline, NMFS initiated a status review on the Cook Inlet beluga whale stock pursuant to the MMPA and the ESA in 1998 (63 FR 64228, November 19, 1998). The annual abundance surveys conducted each June since 1999 provide the following abundance estimates: 357 beluga whales in 1999; 435 beluga whales in 2000; 386 beluga whales in 2001; 313 beluga whales in 2002; 357 beluga whales in 2003; 366 beluga whales in 2004; 278 beluga whales in 2005; 302 beluga whales in 2006; 375 beluga whales in 2007; 321 beluga whales in 2009; 340 beluga whales in 2010; 284 whales in 2011; 312 whales in 2012 (Hobbs et al. 2000; Rugh et al. 2003, 2004a, 2004b, 2005a, 2005b, 2005c, 2006, 2007, 2010; NMFS 2010; Hobbs et al. 2011, Shelden et al. 2012). The overall population trend for the past 10 years for Cook Inlet beluga whales shows them not recovering and still in decline at an annual rate of 0.6 percent (http://www.alaskafisheries.noaa.gov/newsreleases/2013/cibelugapop2012.htm). Publication of the most recent aerial survey conducted in 2014 suggests the population of Cook Inlet belugas has risen to an estimated 340 individuals (Shelden *et al*, 2015).

Figure 3 depicts the distribution of beluga whales in upper Cook Inlet and is based upon NMML data including NMFS aerial surveys. Additional information on beluga whale distribution is known from NMFS data from satellite-tagged belugas, and opportunistic sightings (NMML 2004); baseline studies of beluga whale occurrence in Knik Arm conducted for KABATA (Funk et al. 2005); baseline studies of beluga whale occurrence in Turnagain Arm conducted in preparation for Seward Highway improvements (Markowitz et al. 2007); marine mammal surveys conducted at Ladd Landing to assess a coal shipping project (Prevel Ramos et al. 2008); and marine mammal surveys off Granite Point, the Beluga River, and further down the inlet at North Ninilchik (Brueggeman et al. 2007a, 2007b, 2008).

The collective NMFS aerial survey results show that beluga whales have been consistently found near or in river mouths along the northern shores of upper Cook Inlet (i.e., north of East and West Foreland). In particular, beluga whale groups are seen in the Susitna River Delta, Knik Arm, and along the shores of Chickaloon Bay. Small groups were reported farther south in Kachemak Bay, Redoubt Bay (Big River), and Trading Bay (McArthur River) prior to 1996, but very rarely thereafter. Since the mid-1990s, most (96 to 100 percent) beluga whales in upper Cook Inlet have been concentrated in shallow areas near river mouths, no longer occurring in the central or southern portions of Cook Inlet (Hobbs et al. 2008). Based on these aerial surveys, the concentration of beluga whales in the northernmost portion of Cook Inlet appears to be fairly consistent from June to October (Rugh et al. 2000, 2004a, 2005a, 2006, 2007; Shelden et al. 2008, 2009, 2010).

Other studies and monitoring programs have revealed additional information about beluga whale distribution in Cook Inlet. Studies for KABATA in 2004 and 2005 confirmed the use of Knik Arm by beluga whales from July to October (Funk et al. 2005). Data from tagged whales (14 tags between July and March 2000 through 2003) show beluga whales use upper Cook Inlet intensively between summer and late autumn (Hobbs et al. 2005). As late as October, beluga whales tagged with satellite transmitters continued to use Knik Arm and Turnagain Arm and Chickaloon Bay, but some ranged into lower Cook Inlet south to Chinitna Bay, Tuxedni Bay, and Trading Bay (McArthur River) in the fall (Hobbs et al. 2005). In November, beluga whales moved between Knik Arm, Turnagain Arm, and Chickaloon Bay, similar to patterns observed in September (Hobbs et al. 2005). By December, beluga whales were distributed throughout the upper to mid-inlet. From January into March, they moved as far south as Kalgin Island and slightly beyond in central offshore waters. Beluga whales also made occasional excursions into Knik Arm and Turnagain Arm in February and March in spite of ice cover greater than 90 percent (Hobbs et al. 2005). While they moved widely around Cook Inlet there was no indication from the tagged whales (Hobbs et al. 2005) that beluga whales had a seasonal migration in and out of Cook Inlet.

Depending upon the season, beluga whales can occur in both offshore and coastal waters. Although they remain in the general Cook Inlet area during the winter, they disperse throughout the upper and mid-inlet areas. Data from NMFS aerial surveys, opportunistic sighting reports, and satellite-tagged beluga whales confirm they are more widely dispersed throughout Cook Inlet during the winter months (November-April), with animals found between Kalgin Island and Point Possession. Based upon monthly surveys (e.g., Rugh et al. 2000), opportunistic sightings, and satellite-tag data, there are generally fewer observations of these whales in the Anchorage and Knik Arm area from November through April (NMML 2004; Rugh et al. 2004a).

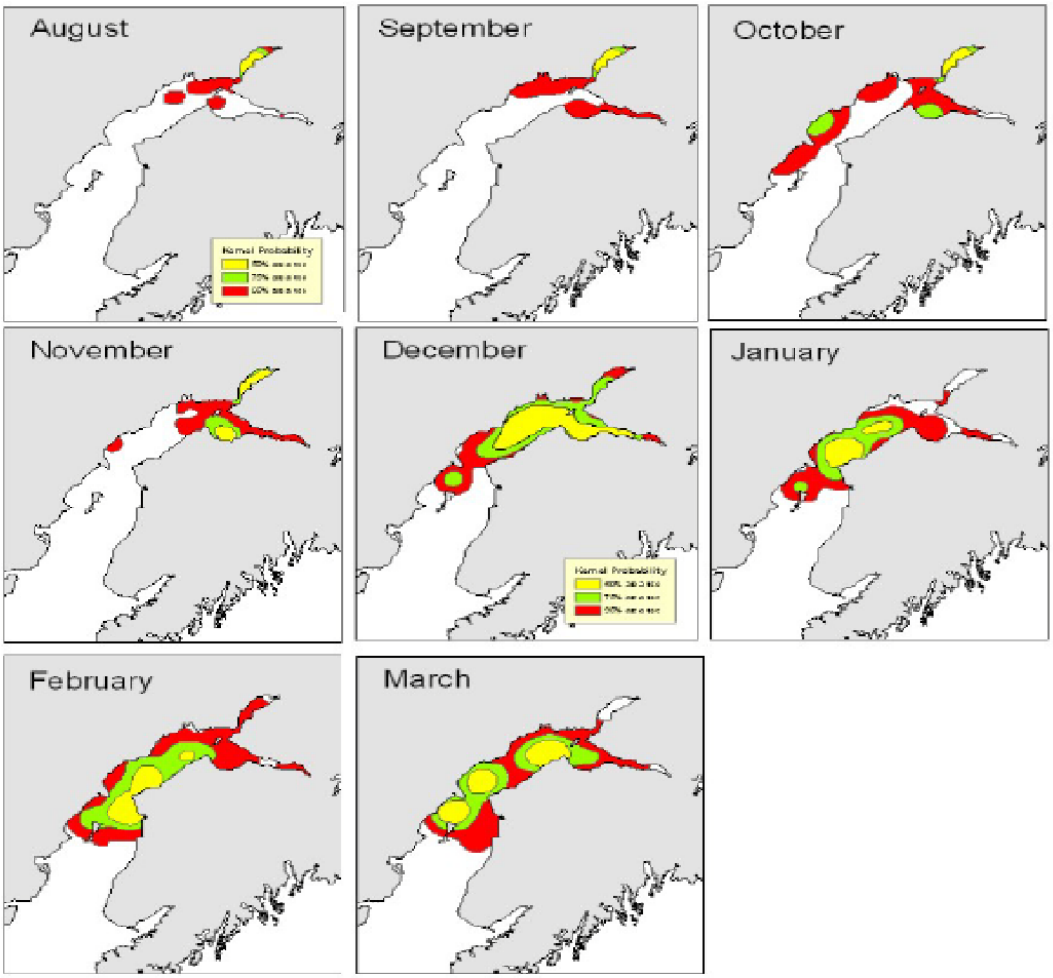

Figure 3. Predicted beluga distribution by month based upon known locations of 14 satellite tagged belugas (predictions derived via kernel probability estimates; Hobbs et al. 2005). Note the large increase in total area use and offshore locations beginning in December and continuing through March. The red area (95 percent probability) encompasses the green (75 percent) and yellow (50 percent) regions. From NMFS 2008b.

During the spring and summer, beluga whales are generally concentrated near the warmer waters of river mouths where prey availability is high and predator occurrence is low (Moore et al. 2000). Most beluga whale calving in Cook Inlet occurs from mid-May to mid-July in the vicinity of the river mouths, although Native hunters have described calving as early as April and as late as August (Huntington 2000).

Beluga whale concentrations in upper Cook Inlet during April and May correspond with eulachon migrations to rivers and streams in the northern portion of upper Cook Inlet (NMFS 2003; Angliss and Outlaw 2005). Data from NMFS aerial surveys, opportunistic sightings, and satellite-tagged beluga whales confirm that they are concentrated along the rivers and nearshore areas of upper Cook Inlet (Susitna River Delta, Knik Arm, and Turnagain Arm) from May through October (NMML 2004; Rugh et al. 2004a). Beluga whales are commonly seen from early July to early October at the mouth of Ship Creek where they feed on salmon and other fish, and also in the vicinity of the Port (e.g., alongside docked ships and within 300 ft of the docks) (Blackwell and Greene 2002; NMML 2004). Beluga whales have also

been observed feeding immediately offshore of the tidelands north of the Port and south of Cairn Point (NMFS 2004).

Steller Sea Lion

Steller sea lions occur in Cook Inlet but south of Anchor Point around the offshore islands and along the west coast of the upper inlet in the bays (Chinitna Bay, Iniskin Bay, etc.) (Rugh et al. 2005a). Portions of the southern reaches of the lower inlet are designated as critical habitat, including a 20-nautical mile buffer around all major haul out sites and rookeries. Rookeries and haulout sites in lower Cook Inlet include those near the mouth of the inlet, which are far south of the project area. Presence of Steller sea lions in the proposed seismic survey area is anticipated to be low or rare. The western distinct population segment is the one that occurs in the proposed area and is the only one still listed under the ESA.

Humpback whale

Humpback whales occur occasionally in Cook Inlet, particularly in the South toward Barren Islands, as the Central North Pacific stock of humpbacks is known to migrate to Alaska for summer feeding. Some of the whales that summer in Alaska have been tagged and known to migrate in winter to Hawaii. NMFS aerial surveys have sighted as many as 47 whales in a single survey period, however they have not sighted more than 10 whales in a survey since 2006 (NMFS, 2012). Humpbacks maintain a seasonal presence in the south of the Inlet, although one whale was reported unusually far north near Anchorage in April 2014.

3.2.3. Non-ESA Listed Marine Mammals

Harbor Seal

Harbor seals inhabit the coastal and estuarine waters of Cook Inlet. In general, harbor seals are more abundant in lower Cook Inlet than in upper Cook Inlet, but they do occur in the upper inlet throughout most of the year (Rugh et al. 2005). Harbor seals are non-migratory; their movements are associated with tides, weather, season, food availability, and reproduction. The major haulout sites for harbor seals are located in lower Cook Inlet, and their presence in the upper inlet coincides with seasonal runs of prey species. For example, harbor seals are commonly observed along the Susitna River and other tributaries along upper Cook Inlet during the eulachon and salmon migrations (NMFS, 2003). During aerial surveys of upper Cook Inlet in 2001, 2002, and 2003, harbor seals were observed 24 to 96 km (15 to 60 mi) south-southwest of Anchorage at the Chickaloon, Little Susitna, Susitna, Ivan, McArthur, and Beluga Rivers (Rugh et al., 2005). During ae 2D test program in March 2011, two harbor seals were observed by vessel-based PSOs. Harbor seals haul out on rocks, reefs, beaches, and drifting glacial ice, and feed on capelin, eulachon, cod, pollock, flatfish, shrimp, octopus, and squid in marine, estuarine, and occasionally fresh waters.

Killer Whale

Numbers of killer whales in Cook Inlet are small compared to the overall population and most are recorded in the lower Cook Inlet. Killer whales are rare in upper Cook Inlet, where transient killer whales are known to feed on beluga whales, and resident killer whales are known to feed on anadromous fish (Shelden et al. 2003). The availability of these prey species largely determines the likeliest times for killer whales to be in the area. Twenty-three sightings of killer whales were reported in the lower Cook Inlet between 1993 and 2004 in aerial surveys by Rugh et al. (2005a). Surveys over 20 years by Shelden et al. (2003) reported 11 sightings in upper Cook Inlet between Turnagain Arm, Susitna Flats, and Knik Arm.

No killer whales were spotted during surveys by Funk et al. (2005), Ireland et al. (2005), Brueggeman et al. (2007a, 2007b, 2008), or Prevel Ramos et al. (2006, 2008). Eleven killer whale strandings have been reported in Turnagain Arm, six in May 1991, and five in August 1993. Very few killer whales, if any, are expected to approach or be in the vicinity of the seismic survey operations area.

Harbor Porpoise

The most recent estimated density of animals in Cook Inlet is 7.2 per 1,000 km^2 (386 mi^2) (Dahlheim et al. 2000) indicating that only a small number use Cook Inlet. Harbor porpoise have been reported in lower Cook Inlet from Cape Douglas to the West Foreland, Kachemak Bay, and offshore (Rugh et al. 2005a). Small numbers of harbor porpoises have been consistently reported in the Upper Cook Inlet between April and October, except for a recent survey that recorded higher numbers than typical. Highest monthly counts include 17 harbor porpoises reported for spring through fall 2006 by Prevel Ramos et al. (2008), 14 for spring of 2007 by Brueggeman et al. (2007a), 12 for fall of 2007 by Brueggeman et al. (2008), and 129 for spring through fall in 2007 by Prevel Ramos et al. (2008) between Granite Point and the Susitna River during 2006 and 2007; the reason for the recent spike in numbers (129) of harbor porpoises in the upper Cook Inlet is unclear and quite disparate with results of past surveys, suggesting it may be an anomaly. The spike occurred in July, which was followed by sightings of 79 harbor porpoise in August, 78 in September, and 59 in October in 2007. The number of porpoises counted more than once was unknown. Therefore, because we lack information regarding double counting, it is possible that the actual numbers are smaller than reported. On the other hand, recent passive acoustic research in Cook Inlet by ADF&G and NMML have indicated that harbor porpoises occur more frequently than expected, particularly in the West Foreland area in the spring (NMFS 2011, personal communication), although overall numbers are still unknown at this time. In 2012, Apache marine mammal observers recorded 137 sightings of 190 estimated individuals; a similar count to the 2007 spike previously observed. Although only 0.7 percent of the Gulf of Alaska population, the increase of sightings in the upper Cook Inlet may reflect more movement of harbor porpoise distribution than previously known.

Gray Whale

Numbers of gray whales in Cook Inlet are small compared to the overall population, but Apache observers recorded nine sightings of nine individuals (including possible resights of the same animal[s]) from May-July 2012. Of those sightings, seven were observed from project vessels, and two were observed from land; no animals were observed during aerial surveys. Gray whales were not previously recorded in Cook Inlet during NMFS aerial surveys, so they were not expected to be observed during Apache's operations (Lomac-MacNair et al. 2013). Sightings in the seismic survey operations area are expected to be minimal. The eastern North Pacific gray whales observed in Cook Inlet are likely migrating to summer feeding grounds in the Bering, Chukchi, and Beaufort seas, though a small number feed along the coast between Kodiak Island and northern California (Matkin 2009; Carretta et al. 2014).

Minke Whale

Numbers of minke whales are very small compared to other species considered in this project. One minke whale was sighted during a NMFS aerial survey in 2006, with anecdotal records of additional minke sightings more recently (NMFS, 2012). Minke whales are much more common in the Bering and Chuckchi Seas, but they are not considered abundant in inshore Gulf of Alaska waters (Allen & Angliss, 2012). Very little is known about the Alaska stock structure, but their low levels of human-related

removals and frequent sightings in Alaska waters mean they are not considered strategic, despite a lack of population information.

Dall's Porpoise

Dall's porpoise are widely distributed across the entire North Pacific Ocean, with one of the only known gaps in their distribution being Upper Cook Inlet (Allen & Angliss, 2012). Their preference is for deep ocean water, which is not the bathymetry found in Cook Inlet. However, they were included in the applicant's request for take because they have been sighted occasionally in lower Cook Inlet. The last NMFS survey sighting of a Dall's porpoise was in 2000. Dall's porpoise have been observed in lower Cook Inlet, including Kachemak Bay and near Anchor Point (Glenn Johnson, pers. comm.), but sightings there are rare. There is only the remote chance that Dall's porpoise might be observed during SAE's proposed survey.

3.3. Socioeconomic Environment

3.3.1. Subsistence

Near the proposed activities, Tyonek is a Dena'ina Athabascan village practicing a subsistence lifestyle. The Village of Tyonek lies on a bluff on the northwest shore of Cook Inlet and has no interconnected road access. According to Census 2010, there were 144 housing units in the community and 70 were occupied. Its population was 88.3 percent American Indian or Alaska Native; 5.3 percent white; and 6.4 percent of the local residents had multi-racial backgrounds (ADCCE 2010).

The principal wild foods harvested and consumed by Dena'ina communities are fish, land mammals (moose), and marine mammals. Salmon consistently provides the major portion of the region's subsistence food, and sockeye is the most harvested. Shellfish, plants, and birds and eggs each make up approximately 2% of the total annual harvest (BOEM 2003).

Native hunters historically have hunted beluga whales and harbor seals for food. The subsistence harvest of beluga transcends nutritional and economic value of the whale as the harvest is an integral part of the cultural identity of the region's Alaska Native communities. Inedible parts of the whale provide Native artisans with materials for cultural handicrafts, and the hunting perpetuates Native traditions by transmitting traditional skills and knowledge to younger generations. However, due to dramatic declines in the Cook Inlet beluga whale population, on May 21, 1999, legislation was passed to temporarily prohibit (until October 1, 2000) the taking of Cook Inlet belugas under the subsistence harvest exemption in section 101(b) of the MMPA without a cooperative agreement between NMFS and the affected Alaska Native Organizations (ANOs) (Public Law No. 106-31, section 3022, 113 Stat. 57,100). That prohibition was extended indefinitely on December 21, 2000 (Public Law No. 106-553, section 1(a)(2), 114 Stat. 2762). NMFS subsequently entered into six annual co-management agreements (2000-2003, 2005-2006) with the Cook Inlet Marine Mammal Council, an ANO representing Cook Inlet beluga hunters, which allowed for the harvest of 1-2 belugas.

On October 15, 2008, NMFS published a final rule that established long-term harvest limits on Cook Inlet beluga whales that may be taken by Alaska Natives for subsistence purposes (73 FR 60976). That rule prohibits harvest for a 5-year interval period if the average stock abundance of Cook Inlet

beluga whales over the prior five-year interval is below 350 whales. Based on the average abundance over the 2002-2007 period, no hunt occurred between 2008 and 2012 (NMFS, 2008a). The Cook Inlet Marine Mammal Council, which managed the Alaska Native Subsistence fishery with NMFS, was disbanded by a unanimous vote of the Tribes' representatives on June 20, 2012. Harvest levels for the current 5-year planning interval (2013-2017) are zero because the average stock abundance for the previous five-year period (2008-2012) was below 350 whales. At this time, no harvest is expected in 2015 or, likely, in 2016.

Consistent with NMFS' implementing regulations, SAE plans to meet with many of the villages and traditional councils throughout the Cook Inlet region, which is outlined in the proposed IHA *Federal Register* notice.

Villages in lower Cook Inlet adjacent to SAE's proposed seismic area (Kenai, Salamatof, and Ninilchik) have either not traditionally hunted beluga whales, or at least not in recent years, and rarely do they harvest sea lions. Between 1992 and 2008, the only reported sea lion harvests from this area were two Steller sea lions taken by hunters from Kenai (Wolfe et al. 2009). These villages more commonly harvest harbor seals, with Kenai reporting an average of about 13 per year between 1992 and 2008 (Wolfe et al. 2008). According to Fall et al. (1984), many of the seals harvested by hunters from these villages were taken on the west side of the inlet during hunting excursions for moose and black bears (or outside SAE's lower Cook unit).

Although marine mammals remain an important subsistence resource in Cook Inlet, the number of animals annually harvested is low, and are primarily harbor seals. Much of the harbor seal harvest occurs incidental to other fishing and hunting activities, and at areas outside of SAE's proposed seismic areas such as the Susitna Delta or the west side of lower Cook Inlet. Also, SAE is unlikely to conduct seismic activity in the vicinity of any of the river mouths where large numbers of seals haul out.

SAE has identified the following features that are intended to reduce impacts to subsistence users:

• In-water seismic activities would follow mitigation procedures to minimize effects on the behavior of marine mammals and, therefore, opportunities for harvest by Alaska Native communities;

- Regional subsistence representatives may support recording marine mammal observations along with marine mammal biologists during the monitoring programs and would be provided with annual reports.

Prior to offshore activities SAE consulted with nearby communities including: Nikiski, Ninilchik Native Association Inc., Tyonek Native Corporation,Tyonek Village, Ninilchik,Nikiski Facilities Group, and United Cook Inlet Drift Association.. SAE presented the program description to the different groups listed in Section 3 of their Plan of Cooperation prior to operations within those areas. These meetings will allowed SAE to understand community concerns, and requests for communication or mitigation. Additional communications will continue throughout the project. Meetings were also held with Native Corporation leaders to establish subsistence activities and timelines. Ongoing discussions and meeting with federal and state agencies will occur during the permit process.

Chapter 4 Environmental Consequences

This chapter of the EA analyzes the impacts of the three alternatives on the human environment. SAE's application, our proposed IHA *Federal Register* notice, and other related environmental analyses identified previously inform our analysis of the direct, indirect, and cumulative effects of our proposed issuance of an Authorization.

Under the MMPA, we have evaluated the potential impacts of SAE's oil and gas exploration seismic operations in order to determine whether to authorize incidental take of marine mammals. Under NEPA, we have determined that an EA is appropriate to evaluate the potential significance of environmental impacts resulting from the issuance of our Authorization.

4.1. Effects of Alternative 1 – Issuance of Authorizations with Mitigation Measures

Alternative 1 is the Preferred Alternative where we would issue an Authorization to SAE allowing the incidental take, by Level B harassment, of nine species of marine mammals, subject to the mandatory mitigation and monitoring measures and reporting requirements set forth in the IHA (see Section 2.3.1), if issued.

4.1.1. Impacts to Marine Mammal Habitat

Our proposed action would have no additive or incremental effect on the physical environment beyond those resulting from the proposed activities. SAE's proposed seismic survey area is not located within a marine sanctuary or a National Park. State wildlife conservation areas have been designated in Cook Inlet; however, those occur mostly on land with some portions along the coasts and would not be impacted by our proposed action of the issuance of an Authorization to take marine mammals. The proposed seismic survey would minimally add to vessel traffic in the region. The proposed activities would not result in substantial damage to ocean and coastal habitats that might constitute marine mammal habitat. Placement and retrieval of the nodes may cause temporary and localized increases in turbidity on the seafloor; however, the turbidity created by placing and removing nodes on the seafloor would settle to background levels within minutes after the cessation of activity. We do not anticipate that the seismic survey operations would physically alter the marine environment or negatively impact the physical environment in the proposed action area. The Authorization would not impact physical habitat features, such as substrates and/or water quality.

NMFS has established critical habitat for both the western distinct population segment of Steller sea lions and Cook Inlet beluga whales (described in section 3.1.1 of this EA). The proposed seismic survey would not occur in locations designated as critical habitat for Steller sea lions, so there would be no effect on these locations. For Cook Inlet beluga whale critical habitat, a portion of SAE's proposed surveying in Lower Cook Inlet is in Critical Habitat Area 2, while none of the proposed surveying would occur in Critical Habitat Area 1. The primary impacts are acoustic in nature, which would not result in permanent destruction of any critical habitat. Additionally, mitigation measures would be required in the Authorization, if issued, to reduce activity near Critical Habitat Area 1 when beluga whales are present in high numbers. Therefore, impacts to habitat would be minimal. More information on potential impacts to marine mammal habitat is contained in SAE's application (Owl Ridge, 2015), the Biological Assessment (Fairweather Science, 2015), and our proposed IHA notice, which are incorporated herein by reference.

4.1.2. Impacts to Marine Mammals

We expect that disturbance from acoustic stimuli associated with the seismic survey program would have the potential to impact marine mammals. Acoustic stimuli generated by the airgun arrays (and to a lesser extent the pingers) may affect marine mammals in one or more of the following ways: tolerance, masking of natural sounds, behavioral disturbance, and temporary or permanent hearing impairment, or non-auditory physical effects (Richardson et al. 1995a). Our proposed IHA notice and SAE's application (Owl Ridge, 2015) provide detailed descriptions of these potential effects of seismic surveys on marine mammals. That information is incorporated herein by reference and summarized next.

Numerous studies have shown that underwater sounds from industry activities are often readily detectable by marine mammals in the water at distances of many kilometers. Numerous studies have also shown that marine mammals at distances more than a few kilometers away often show no apparent response to industry activities of various types (Miller et al., 2005; Bain and Williams, 2006). This is often true even in cases when the sounds must be readily audible to the animals based on measured received levels and the hearing sensitivity of that mammal group. Although various baleen whales, toothed whales, and (less frequently) pinnipeds have been shown to react behaviorally to underwater sound such as airgun pulses or vessels under some conditions, at other times mammals of all three types have shown no overt reactions (e.g., Malme et al., 1986; Richardson et al., 1995a,b; Madsen and Mohl, 2000; Croll et al., 2001; Jacobs and Terhune, 2002; Madsen et al., 2002; Miller et al., 2005).

Masking is the obscuring of sounds of interest by other sounds, often at similar frequencies. Marine mammals are highly dependent on sound, and their ability to recognize sound signals amid other noise is important in communication, predator and prey detection, and, in the case of toothed whales, echolocation. Although some degree of masking is inevitable when high levels of manmade broadband sounds are introduced into the sea, marine mammals have evolved systems and behavior that function to reduce the impacts of masking. Structured signals, such as the echolocation click sequences of small toothed whales, may be readily detected even in the presence of strong background noise because their frequency content and temporal features usually differ strongly from those of the background noise (Au and Moore, 1988, 1990). The components of background noise that are similar in frequency to the sound signal in question primarily determine the degree of masking of that signal.

Masking effects of underwater sounds from SAE's proposed activities on marine mammal calls and other natural sounds are expected to be limited. For example, beluga whales primarily use high-frequency sounds to communicate and locate prey; therefore, masking by low-frequency sounds associated with survey activities is not expected to occur (Gales, 1982). There is evidence of other marine mammal species continuing to call in the presence of industrial activity. Annual acoustical monitoring near BP's Northstar production facility during the fall bowhead migration westward through the Beaufort Sea has recorded thousands of calls each year (for examples, see Richardson et al., 2007; Aerts and Richardson, 2008). Construction, maintenance, and operational activities have been occurring from this facility for over 10 years. To compensate and reduce masking, some mysticetes may alter the frequencies of their communication sounds (Richardson et al., 1995a; Parks et al., 2007).

There is little concern regarding masking in this case due to the brief duration of these pulses and relatively longer silence between airgun shots (9 – 12 seconds) near the sound source. Therefore, masking effects are anticipated to be limited, especially in the case of odontocetes, given that they

typically communicate at frequencies higher than those of the airguns. Additionally, gray whales (which depend on lower frequency ranges) are not anticipated to occur regularly or in high numbers in the proposed seismic survey operational areas.

Marine mammals may behaviorally react to sound when exposed to anthropogenic noise. These behavioral reactions are often shown as: changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where noise sources are located; and/or flight responses (e.g., pinnipeds flushing into water from haul-outs or rookeries). The onset of behavioral disturbance from anthropogenic noise depends on both external factors (characteristics of noise sources and their paths) and the receiving animals (hearing, motivation, experience, demography) and is also difficult to predict (Richardson et al. 1995a; Southall et al. 2007).

Little systematic information is available about reactions of beluga whales, killer whales, and harbor porpoise to noise pulses. In general, small toothed whales more often tend to head away, or to maintain a somewhat greater distance from the vessel, when a large airgun array is operating (e.g., Stone and Tasker 2006; Weir 2008; Barry et al. 2010). Beluga whales exhibit changes in behavior when exposed to strong, pulsed sounds similar in duration to those typically used in seismic surveys (Finneran et al. 2000, 2002). However, the animals tolerated high received levels of sound (peak–peak level >200 dB re 1 μPa) before exhibiting aversive behaviors (Richardson et al. 1995b). Baleen whales generally tend to avoid operating airguns, but avoidance radii are quite variable. Whales are often reported to show no overt reactions to pulses from large arrays of airguns at distances beyond a few kilometers, even though the airgun pulses remain well above ambient noise levels out to much greater distances (Miller et al. 2005). Results of studies of gray, bowhead, and humpback whales have determined that received levels of pulses in the 160–170 dB re 1 μPa rms range seem to cause obvious avoidance behavior in a substantial fraction of the animals exposed. In many areas, seismic pulses from large arrays of airguns diminish to those levels at distances ranging from 2.8-9 mi (4.5-14.5 km) from the source. Baleen whales within those distances may show avoidance or other strong disturbance reactions to the airgun array. However, gray whales are not common in the seismic survey area, and humpback whales are a rare occurrence.

While there are no published data on seismic effects on sea lions or harbor seals, anecdotal data and data on arctic seals suggest that sea lions and other pinnipeds generally tolerate strong noise pulses due to the similarity in anatomy and physiology (Richardson et al. 1995a). Monitoring studies in the Alaskan and Canadian Beaufort Sea during 1996–2002 provided considerable information regarding behavior of arctic seals exposed to seismic pulses (Miller et al. 2005; Harris et al. 2001; Moulton and Lawson 2002). These seismic projects generally were much larger than the proposed survey and usually involved arrays of 6 to 16 with as many as 24 airguns with total volumes 560 to 1500 cui. The combined results suggest that some seals avoid the immediate area around seismic vessels. Reactions are expected to be very localized and confined to relatively small distances and durations, with no long-term effects on individuals or populations.

The seismic survey operations and potential take of marine mammals is proposed to occur over the course of one year. During that time, active seismic airgun operations would occur at most for a few hours several times a day. Therefore, airguns are not intended to be operated continuously for days or weeks on

end. Thus, marine mammals in the ensonified areas will not be exposed to airgun sounds continuously for periods beyond a few hours.

Table 4 outlines our current acoustic thresholds for estimating marine mammal harassment, and Table 5 outlines the various radii for the airgun arrays proposed for use during SAE's oil and gas exploration seismic survey operations in both the nearshore and channel survey locations.

Table 4. Current acoustic exposure criteria used by NMFS.

Criterion	Criterion Definition	Threshold
Level A Harassment (Injury)	Permanent Threshold Shift (PTS) (Any level above that which is known to cause TTS)	180 dB re 1 microPa-m (cetaceans) / 190 dB re 1 microPa-m (pinnipeds) root mean square (rms)
Level B Harassment	Behavioral Disruption (for impulse noises)	160 dB re 1 microPa-m (rms)
Level B Harassment	Behavioral Disruption (for continuous, noise)	120 dB re 1 microPa-m (rms)

Table 5. Distances to Level B and Level A harassment sound level thresholds for shallow and deep surveys.

Array (cubic inch)	Water Depth	190 dB radius (m)	180 dB radius (m)	160 dB radius (km)
440	Very Shallow	50	182	3.05
1,760	Shallow	830	1,530	4.27
1,760	Deep	880	1,840	6.83

In sum, we interpret these effects on all marine mammals as falling within the MMPA definition of Level B (behavioral) harassment. We expect these impacts to be minor because we do not anticipate measurable changes to the population or impacts to rookeries, mating grounds, and other areas of similar significance.

Under the Preferred Alternative, we would authorize incidental take, by Level B harassment only, of nine species of marine mammals. We expect no long-term or substantial adverse effects on marine mammals, their habitats, or their role in the environment. We base our conclusion on the results of previous monitoring reports submitted by another Cook Inlet IHA applicant, Apache, for a similar 2012 Cook Inlet 3D seismic survey.

SAE proposed a number of monitoring and mitigation measures for marine mammals, and we included some additional mitigation measures not proposed by SAE, as part of our evaluation for the Preferred Alternative. In consideration of the potential effects of the proposed seismic survey, we determined that the mitigation and monitoring measures described in Section 2.3.1 of this EA would be appropriate for the preferred alternative to meet the Purpose and Need.

Injury: SAE did not request authorization to take marine mammals by injury (Level A harassment), serious injury, or mortality. Based on the results of our analyses, SAE's environmental analyses, and

previous monitoring reports for the same activities, there is no evidence that SAE's planned activities would result in injury, serious injury, or mortality within the action area. The mitigation and monitoring measures described in Section 2.3.1 of this EA would minimize any potential risk for marine mammals.

Vessel Strikes: The potential for striking marine mammals is a concern with vessel traffic. Studies have associated ship speed with the probability of a ship strike resulting in an injury or mortality of an animal. However, it is highly unlikely that SAE would strike a marine mammal. Typical vessel speeds of the source vessels while collecting seismic data is between 4-5 knots, which is relatively slow. Moreover, mitigation measures would be required of SAE to reduce speed or alter course if collisions with marine mammals appear likely.

Entanglement: Although some of SAE's equipment contains cables or lines, the risk of entanglement is extremely remote. Additionally, mortality from entanglement is not anticipated. The material used by SAE and the amount of slack is not anticipated to allow for marine mammal entanglements.

Estimated Take of Marine Mammals by Level B Incidental Harassment: SAE has requested take by Level B harassment as a result of the acoustic stimuli generated by their proposed seismic survey. We expect that the survey would cause a short-term behavioral disturbance for marine mammals in the proposed areas.

As mentioned previously, we estimate that the activities could potentially affect, by Level B harassment only, nine species of marine mammals under our jurisdiction. For each species, these estimates are small numbers (less than two percent for each species, except beluga whales for which estimated takes are 9.6 percent) relative to the population sizes. Table 7 outlines the number of Level B harassment takes that we propose to authorize on an annual basis in the Authorization, the regional population estimates for marine mammals in the action area, and the percentage of each population or stock that may be taken as a result of SAE's activities.

Our proposed Authorization and SAE's application (Owl Ridge, 2015) contain complete descriptions of how these take estimates were derived. A short summary is provided here. For all marine mammal species (except for beluga whales and harbor seals), take estimates were derived by multiplying the expected density by the anticipated area ensonified to sound levels $\geq$ 160 dB rms by the expected number of seismic survey days per year in the project area (160 days). Based on aerial survey data and sightings of Steller sea lions in the action area of SAE's proposed activities, the number of individuals likely to be taken by Level B harassment has been changed to 25 individuals. The estimation of take of western DPS Steller sea lions assumes annual take equal to the maximum number of western DPS Steller sea lions observed in the action area in a year, as reflected by the maximum number of animals reported by aerial observers surveying the action area between 2004 and 2014 (4 Steller sea lions were observed by Apache in 2012, and one observation of 20 Steller sea lions was made on June 10, 2006 at the southern extreme of the action area on NMFS aerial surveys of Cook Inlet from 2004-2014). NMFS has also determined that a take of five humpback whales is appropriate. No more than two humpback whales have been recorded by NMFS observers or Apache PSOs in Cook Inlet in any given year, and the probability of project vessels encountering and taking all individuals in the action area is low. NMFS has determined that the 2014 take of a humpback by Apache was a highly unusual event that is unlikely to be repeated during this survey due to the rarity of this species in the action area and the effectiveness of project mitigation measures

Using the daily ensonified area x number of survey days x density to estimate harbor seal take, the number of instances of exposure above the 160-dB threshold estimated for SAE's activity in Cook Inlet is 19,315. However, when we examine monitoring data from previous activities, it is clear this number is an overestimate – compared to both aerial and vessel based observation efforts. Apache's monitoring report from 2012 details that they saw 2,474 harbor seals from 29 aerial flights (over 29 days) in the vicinity of the survey during the month of June, which is the peak month for harbor seal haulout. Using the most conservative factor of 1.65 (allowing us to consider that some of the other individuals on land may have entered the water at other points in day), if Apache saw 2,474 seals hauled out then there were an estimated 1,500 seals in the water during those 29 days. If, because there were only 29 surveys, we conservatively multiply by 5.5 to estimate the number of seals that might have been seen if the aerial surveys were conducted for 160 days, this yields an estimate of 8,250 instances of seal exposure in the water, which is far less than the estimated 19,315. During a 2012 survey, Apache's PSOs sighted a total of 285 seals in water over 147 days of activity which would rise to about 310 if adjusted to reflect 160 days of effort. Given the size of the disturbance zone for these activities, it is likely that not all harbor seals that were exposed were seen by PSOs, however 310 is still far less than the estimate of 19,315 given by the density calculations. Additionally, based on SAE's estimate of surveying 32 patches in 160 days, SAE would shoot one patch in 5 days. If seals are generally returning to haulouts in the survey area over the 5 days of any given patch shoot, then any given seal in the area could be exposed a minimum of one day and a maximum of all five days, with an average of 3 days. If the original exposure estimate using density is 19,315 exposures, then when divided by three (the average number of times an animal could be exposed during the shooting of one patch), the expected number of individuals exposed is 6,438, which is approximately 28% of the population. This number is also likely an overestimate given that adjoining patches may be shot, meaning the same seals could be exposed over multiple patches. Given these multiple methods, as well as the behavioral preferences of harbor seals for haulouts in certain parts of the Inlet (Montgomery et al, 2007), and high concentrations at haulouts in the lower Inlet (Boveng *et al*.), it is unreasonable to expect that more than 25% of the population, or 5,725 individuals, would be taken by Level B harassment during SAE's activity.For beluga whales, SAE used the habitat model developed by Goetz et al. (2012a) to derive density estimates for the whales throughout Cook Inlet. Based on expected densities and known seasonal distribution of Cook Inlet beluga whales, SAE proposes to develop annual operational plans to minimize beluga whale takes and to operate in a way so as not to exceed 30 takes in a year. The annual take estimate for beluga whales takes into consideration the mitigation measures described in Section 2.3.1 of this EA. We do not expect the proposed activities to impact rates of recruitment or survival for any affected species or stock. Further, the activities would not adversely affect marine mammal habitat.

Table 7. Proposed Level B harassment take levels, species or stock abundance, and percentage of population proposed to be taken.

Species	Average Density (#individuals/km^2)	Proposed Level B Take	Abundance	Percentage of Population	Trend
Beluga whale	Upper=0.0212 Lower=0.0056	30	312	9.6	Decreasing
Humpback whale	0.0024	5	7,469	0.067	Southeast Alaska increasing
Minke	1.14E-05	1	1,233	0.06	No reliable

whale					information
Gray whale	5.33E-05	7	19,126	0.033	Stable/increasing
Killer whale	0.00082	55	2,347 (resident) 345(transient)	2.34 15.9	Resident stock possibly increasing Transient stock stable
Harbor porpoise	0.0033	219	31,046	0.70	No reliable information
Dall's porpoise	0.0002	14	83,400	0.016	No reliable information
Harbor seal	0.28	5,725	22,900	25	Stable
Steller sea lion	0.0082	25	45,649	0.054	Decreasing but with regional variability (some stable or increasing)

4.1.3. Impacts on Subsistence

Under the Alternative 1 (the Preferred Alternative), SAE's seismic survey in the Cook Inlet is expected to have minor and temporary effects on subsistence wildlife and marine mammals in the area. Sound from seismic activities and array guns might temporarily displace wildlife from the area, but animals are expected to return to the area following the cessation of use of sound sources during survey activities.

Residents of the Native Village of Tyonek are the primary marine mammal subsistence users in Knik Arm area. However, due to dramatic declines in the Cook Inlet beluga whale population, on May 21, 1999, legislation was passed to temporarily prohibit (until October 1, 2000) the taking of Cook Inlet belugas under the subsistence harvest exemption in section 101(b) of the MMPA without a cooperative agreement between NMFS and the affected Alaska Native Organizations (ANOs) (Public Law No. 106-31, section 3022, 113 Stat. 57,100).. That prohibition was extended indefinitely on December 21, 2000 (Public Law No. 106-553, section 1(a)(2), 114 Stat. 2762). NMFS subsequently entered into six annual co-management agreements (2000-2003, 2005-2006) with the Cook Inlet Marine Mammal Council, an ANO representing Cook Inlet beluga hunters, which allowed for the harvest of 1-2 belugas. On October 15, 2008, NMFS published a final rule that established long-term harvest limits on the Cook Inlet beluga whales that may be taken by Alaska Natives for subsistence purposes (73 FR 60976). That rule prohibits harvest for a five-year period, if the average abundance for the Cook Inlet beluga whales from the prior five year period is below 350 whales. Based on the average abundance over the 2002-2007 period, no hunt occurred between 2008 and 2012 (NMFS, 2008a). Harvest levels for the current 5-year planning interval (2013-2017) are zero because the average stock abundance for the previous five year period (2008-2012) was below 350 whales. At this time, no harvest is expected in 2015, or likely 2016. Tyonek Natives occasionally harvest harbor seals, but their primary source of red meat is moose.

Data on the harvest of other marine mammals in Cook Inlet are lacking. The only data available for subsistence harvest of harbor seals, harbor porpoises, and killer whales in Alaska are in the marine mammal stock assessments. However, these numbers are for the entire Gulf of Alaska not just Cook Inlet, and they are not indicative of the harvest in Cook Inlet. Because of the relatively small proportion of

marine mammals occurring in Cook Inlet, the number harvested is expected to be extremely low. For example, there is a low level of subsistence hunting for harbor seals in Cook Inlet. Seal hunting occurs opportunistically among Alaska Natives who may be fishing or travelling in the upper Inlet near the mouths of the Susitna River, Beluga River, and Little Susitna River (B. Smith, NMFS, pers. comm.).

SAE has identified the following features that are intended to reduce impacts to marine mammal subsistence users:

- In-water seismic activities would follow mitigation procedures to minimize effects on the behavior of marine mammals and, therefore, opportunities for harvest by Alaska Native communities; and

- Regional subsistence representatives may support recording marine mammal observations along with marine mammal biologists during the monitoring programs and would be provided with annual reports.

SAE concluded, and NMFS agrees, that the size of the affected area, mitigation measures, and input from the consultations from Alaska Natives should result in the proposed action having no unmitigable adverse impact on the availability of marine mammals for subsistence uses. SAE and NMFS recognize the importance of ensuring that Alaska Native Organizations and federally recognized tribes are informed, engaged, and involved during the permitting process and will continue to work with the ANOs and tribes to discuss their operations and activities.

NMFS anticipates that any effects from SAE's proposed seismic survey on marine mammals, especially harbor seals and Cook Inlet beluga whales, which are or have been taken for subsistence uses, would be short-term, site specific, and limited to inconsequential changes in behavior and mild stress responses. NMFS does not anticipate that the authorized taking of affected species or stocks would reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (1) Causing the marine mammals to abandon or avoid hunting areas; (2) directly displacing subsistence users; or (3) placing physical barriers between the marine mammals and the subsistence hunters; and that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

4.2. Effects of Alternative 2 – No Action Alternative

Under the No Action Alternative, NMFS would not issue an IHA to SAE for the taking, by Level B harassment, of small numbers of marine mammals, incidental to conducting a seismic survey in Cook Inlet from May 13~~8~~, 2015 to May 12~~7~~, 2016. The applicant would not receive an exemption from the MMPA and ESA prohibitions against take and would not perform the survey, and therefore there would be no effect on the environment. The incidental take of marine mammals, including those listed as threatened or endangered, resulting from SAE's survey would not be exempted. It is unlikely the applicant would conduct the research in the absence of a permit, because to do so would risk sanctions and enforcement actions under the MMPA and ESA.

4.3. Effects of Alternative 3 – Issuance of Authorization with Additional Mitigation and Monitoring Measures

4.3.1. Impacts to Marine Mammal Habitat

Effects to the physical environment would be the same under Alternative 3 as those described above for the survey itself in Alternative 1. No additional effects beyond those already described would be expected.

4.3.2. Impacts to Marine Mammals

Marine mammals would still be expected to be harassed by the proposed seismic survey in Cook Inlet. As described in Alternative 1, anticipated impacts to marine mammals associated with SAE's proposed seismic survey (primarily resulting from noise propagation) are from vessel movements and airgun and other active acoustic sources operations. Potential impacts to marine mammals might include one or more of the following: tolerance, masking of important natural signals, behavioral disturbance, and temporary or permanent hearing impairment or non-auditory effects. These are the same types of reactions that would be anticipated under the Preferred Alternative (Alternative 1).

The primary difference under Alternative 3 is that additional mitigation and monitoring measures for detecting marine mammals would be required. These additional measures include a 120-dB monitoring (safety) zone for beluga whale cow/calf pairs, active acoustic monitoring, and the use of unmanned aerial vehicles to conduct aerial monitoring. While the technologies for these monitoring methods are still being developed and refined, it is expected that they would allow for additional detection of marine mammals beyond visual observations from shipboard observers. Being able to sight the entire 120 dB radius would give a more comprehensive picture of animals exposed, however this is not feasible from aboard SAE's proposed vessels. These additional monitoring measures could allow for mitigation measures (i.e., power-downs and shutdowns) to be implemented more quickly and more frequently, if practicable, thereby potentially reducing further the impacts on the affected species or stocks. However, until these technologies are developed and fully tested, we are unable to fully assess the impacts of such an alternative.

4.3.3. Impacts to Subsistence

Under Alternative 3, impacts to marine mammal subsistence are anticipated to be the same as those described for Alternative 1.

4.4. Unavoidable Adverse Impacts

SAE's application, our proposed IHA notice, and other environmental analyses identified previously summarize unavoidable adverse impacts to marine mammals or the populations to which they belong or on their habitats, as well as subsistence uses of marine mammals, occurring in the seismic survey area. We incorporate those documents by reference.

We acknowledge that the incidental take authorized would potentially result in some level of unavoidable adverse impacts. However, we expect that the numbers of individuals of each species or stock taken by harassment would be small (relative to species or stock abundance), that the seismic survey and the take resulting from the seismic survey activities would have a negligible impact on the affected species or stocks of marine mammals, and that there would not be an unmitigable adverse impact to subsistence uses of marine mammals in Cook Inlet.

4.5. Cumulative Effects

NEPA defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR §1508.7). Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time.

The Cook Inlet region is a major population center in the State of Alaska and supports a wide range of activities. The proposed seismic survey would add another, albeit temporary, industrial activity to upper Cook Inlet. This activity would be limited to a small area of the upper Inlet, and there would be no objects or materials permanently released into the water column. This section provides a brief summary of the human-related activities affecting the marine mammal species in the action area.

4.5.1. Subsistence Hunting

In Cook Inlet, Native hunters historically have hunted beluga whales and harbor seals for food. The subsistence harvest of beluga transcends nutritional and economic value of the whale as the harvest is an integral part of the cultural identity of the region's Alaska Native communities. Inedible parts of the whale provide Native artisans with materials for cultural handicrafts, and the hunting perpetuates Native traditions by transmitting traditional skills and knowledge to younger generations. However, due to dramatic declines in the Cook Inlet beluga whale population, on May 21, 1999, legislation was passed to temporarily prohibit (until October 1, 2000) the taking of Cook Inlet belugas under the subsistence harvest exemption in section 101(b) of the MMPA without a cooperative agreement between NMFS and the affected ANOs (Public Law No. 106-31, section 3022, 113 Stat. 57,100). That prohibition was extended indefinitely on December 21, 2000 (Public Law No. 106-553, section 1(a)(2), 114 Stat. 2762). NMFS subsequently entered into six annual co-management agreements (2000-2003, 2005-2006) with the Cook Inlet Marine Mammal Council, an ANO representing Cook Inlet beluga hunters, which allowed for the harvest of 1-2 belugas.

On October 15, 2008, NMFS published a final rule that established long-term harvest limits on Cook Inlet beluga whales that may be taken by Alaska Natives for subsistence purposes (73 FR 60976). That rule prohibits harvest for a 5-year interval period if the average stock abundance of Cook Inlet beluga whales over the prior five-year interval is below 350 whales. Based on the average abundance over the 2002-2007 period, no hunt occurred between 2008 and 2012 (NMFS, 2008a). The Cook Inlet Marine Mammal Council, which managed the Alaska Native Subsistence fishery with NMFS, was disbanded by a unanimous vote of the Tribes' representatives on June 20, 2012. Harvest levels for the current 5-year planning interval (2013-2017) are zero because the average stock abundance for the previous five-year period (2008-2012) was below 350 whales.At this time, no harvest is expected in 2015 or, likely, in 2016. Additional information on the Cook Inlet beluga harvest can be found in NMFS (2008a).

4.5.2. Pollution

As the population in urban areas continue to grow, an increase in amount of pollutants that enter Cook Inlet is likely to occur. Sources of pollutants in urban areas include runoff from streets and discharge from wastewater treatment facilities. Gas, oil, and coastal zone development projects (e.g., the Chuitna Coal Mine) also contribute to pollutants that enter Cook Inlet through discharge. Gas, oil, and coastal zone

development will continue to take place in Cook Inlet; therefore, it would be expected that pollutants could increase in Cook Inlet. However, the U.S. Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (ADEC) will continue to regulate the amount of pollutants that enter Cook Inlet from point and non-point sources through National Pollution Discharge Elimination Systems (NPDES) permits. As a result, permittees will be required to renew their permits, verify they meet permit standards and potentially upgrade facilities. Additionally, the extreme tides and strong currents in Cook Inlet may contribute in reducing the amount of pollutants found in the Inlet.

4.5.3. Fisheries Interaction

Fishing is a major industry in Alaska. As long as fish stocks are sustainable, subsistence, personal use, recreational and commercial fishing will continue to take place in Cook Inlet. As a result there will be continued prey competition, risk of ship strikes, potential harassment, potential for entanglement in fishing gear and potential displacement from important foraging habitat for the Cook Inlet beluga whales. NMFS and the ADF&G will continue to manage fish stocks and monitor and regulate fishing in Cook Inlet to maintain sustainable stocks.

4.5.4. Vessel Traffic

Major contributors to vessel traffic throughout Cook Inlet include port facilities, oil and gas development, and commercial and recreational fishing. The Port of Anchorage (POA) is a major Alaskan port located adjacent to Anchorage in upper Cook Inlet. While the POA is outside the action area considered in this EA, the POA yields a high volume of vessels traffic that must pass through or near the action area described in this EA. The POA provides 90 percent of the consumer goods for 85 percent of the state of Alaska. The POA handles the majority of Alaska's refined petroleum products and the bulk of jet fuel for Joint Base Elmendorf-Richardson and the Ted Stevens Anchorage International Airport (100 and 60 percent respectively; POA, 2014). Major vessels calling to the POA include cargo ships, barges, tankers, dredgers, military ships and tug boats (POA, 2009). Based on data from 1998-2011, an average of approximately 450 vessels call to the POA annually (POA, 2014). The POA is currently under construction and expanding its facilities. As a result, vessel traffic will increase once the project is complete.

Port MacKenzie is located in upper Cook Inlet and also contributes to vessel traffic that passes through or near the EA action area. It receives about two large ships annually (i.e. a landing craft and/or a barge), which is substantially less than the POA. However, the number of ships calling to port at Port MacKenzie is expected to increase over the next five years; the Rail Extension and expanding the currently existing deep draft dock are planned for construction. Smaller port facilities that contribute to vessel traffic in the action area include Nikiski, the City of Kenai, Kasilof, Ninilchik, Anchor River, Tyonek and Drift River. Vessels ranging from tankers to fishing boats call to these ports (Kenai Peninsula Borough, 2003). Gas and oil development also contribute to vessel traffic in the action area, as well as commercial and recreational fishing vessels.

4.5.5. Gas and Oil Development

Currently, there are several gas and oil development projects in the proposed action area, and it is likely that future gas and oil development will continue to take place in the action area. There have been developments since the proposed Authorization and draft EA and Apache does not currently anticipate conducting any seismic activities in the 2015 open water season. The exploratory drilling program

proposed by Bluecrest is expected to occur for less than 90 days during the 2015 open water season. The area for this activity is far south of beluga Critical Habitat Area 1 as well as far east and north of segments of beluga Critical Habitat Area 2 and does not overlap with the area SAE is expecting to survey. Protected species observers are expected to be used during all phases of the project. Impacts from gas and oil development include increased noise from seismic activity, vessel and air traffic and well drilling; discharge of wastewater; habitat loss from the construction of oil and gas facilities; and contaminated food sources and/or injury from a natural gas blowout or oil spill. The risk of these impacts may increase as oil and gas development increases; however, new development will undergo consultation and permitting requirements prior to exploration and development. If Authorizations are issued to these other applicants, they would be required to implement mitigation and monitoring measures to reduce impacts to marine mammals and their habitat in the area and would be subject to the same MMPA and ESA standards that apply to this Authorization.

Support vessels are required for gas and oil development to transport supplies and products to and from the facilities. Not only will the support vessels from increased gas and oil development likely increase noise in the action area, there is a potential for a slightly increased risk of ship strikes with beluga whales and other marine mammals; however, ship strikes have not been definitively confirmed in a Cook Inlet beluga whale death, and monitoring measures should reduce this risk by placing visual monitors on ships to look out for whales.

4.5.6. Coastal Zone Development

Coastal zone development may result in the loss of habitat, increased vessel traffic, increased pollutants and increased noise associated with construction and noise associated with the activities of the projects after construction. In the action area, two main projects are being considered, the Chuitna Coal Mine and the Ocean Renewable Power Company (ORPC) Tidal Energy Project.

Chuitna Coal Project

PacRim Coal, LP is proposing to develop, construct and operate a coal mine and export facility 19 km (12 mi) northwest of the Village of Tyonek. Potential impacts to marine mammals in upper Cook Inlet from the Chuitna Coal Project would include the construction of the coal export facility and surface water discharge. The coal export facility includes an overland coal conveyer and ship loading berth and would extend from shore into Cook Inlet. The conveyer and ship berth would incorporate tower sites approximately 335 m (1,100 ft) apart to allow for uninhibited movement of marine life (PacRim Coal, LP, 2011). No chemical or water-based processing of the coal would take place; therefore, the expected sources of discharge from the project would include rainfall, snowmelt and groundwater (PacRim Coal, LP, 2011). Prior to discharging water into Cook Inlet, the water would be directed to sediment control structures and meet the water quality criteria described by the Alaska Pollution Discharge Elimination Systems (APDES) permit (PacRim Coal, LP 2011).

ORPC Alaska Tidal Energy Projects

The ORPC is proposing two tidal energy projects in Cook Inlet. The first tidal energy project would be located on the Westside of Fire Island near Anchorage, and the second project would be located adjacent to the East Foreland in the vicinity of Nikiski on the Kenai Peninsula (ORPC, 2011). The tidal energy projects would require the installation of an array of turbine generator units and transmission cables on the seafloor to harness the tidal energy. The tidal energy will be converted to electrical energy at stations

on land. These projects are still in preliminary testing and environmental monitoring phases (ORPC, 2011).

4.5.7. Marine Mammal Research

Because many important aspects of marine mammal biology remain unknown, or are incompletely studied, and because management of these species and stocks requires knowledge of their distribution, abundance, migration, population, ecology, physiology, genetics, behavior, and health, free-ranging marine mammal species are frequently targeted for scientific research and studies. Research activities normally include close approach by vessel and aircraft for line-transect surveys; behavioral observation; photo-identification and photo-video-grammetry; passive acoustic recording; attachment of scientific instruments (tagging), both by implantable and suction cup tags; biopsy sampling, including skin and blubber biopsy and swabbing; land-based surveys; live capture for health assessments, and blood and tissue sampling, pinniped tooth extraction, and related pinniped anesthesia procedures. All researchers are required to obtain a scientific research permit from NMFS Office of Protected Resources under the MMPA and/or ESA (if an ESA-listed species is involved). Currently, the permits authorizing research on beluga whales in Cook Inlet, as wells as permits authorizing research on harbor seals, harbor porpoises, Steller sea lions, and killer whales in Alaskan waters may have cumulative effects on these species and stocks. NMFS anticipates that scientific research on marine mammals in Cook Inlet will continue, and possibly expand, due to the increasing need to better understand distribution and abundance relative to temporal (seasonal, diel, or tidal) and spatial (geographic or bathymetric) parameters.

4.5.8. Climate Change

The 2007 Intergovernmental Panel on Climate Change concluded that there is very strong evidence for global warming and associated weather changes and that humans have "very likely" contributed to the problem through burning fossil fuels and adding other "greenhouse gases" to the atmosphere (IPCC, 2007). This study involved numerous models to predict changes in temperature, sea level, ice pack dynamics, and other parameters under a variety of future conditions, including different scenarios for how human populations respond to the implications of the study.

Evidence of climate change in the past few decades, commonly referred to as global warming, has accumulated from a variety of geophysical, biological, oceanographic, and atmospheric sources. The scientific evidence indicates that average air, land, and sea temperatures are increasing at an accelerating rate. Although climate changes have been documented over large areas of the world, the changes are not uniform and affect different areas in different ways and intensities. Arctic regions have experienced some of the largest changes, with major implications for the marine environment as well as for coastal communities. Recent assessments of climate change, conducted by international teams of scientists (Gitay et al., 2002 for the Intergovernmental Panel on Climate Change; (IPCC) Arctic Climate Impact Assessment, 2004; IPCC, 2007), have reached several conclusions of consequence for this EA:

- Average arctic temperatures increased at almost twice the global average rate in the last 100 years.
- Satellite data since 1978 show that perennial arctic sea ice extent has shrunk by 2.7 percent per decade, with larger decreases in sea ice extent in summer of 7.4 percent per decade.
- Arctic sea ice thickness has declined by about 40 percent during the late summer and early autumn in the last three decades of the 20th century.

Marine mammals are classified as sentinel species because they are good indicators of environmental change. Arctic marine mammals are ideal indicator species for climate change, due to their circumpolar distribution and close association with ice formation. NMFS recognizes that warming of the Arctic, which results in the diminishing of ice, could be a cause for concern to marine mammals. In Cook Inlet, marine mammal distribution is dependent upon ice formation and prey availability, among other factors. For example, belugas often travel just along the ice pack and feed on prey beneath it (Richardson et al., 1990, 1991). Any loss of ice could result in prey distribution changes or loss; however, beluga whales do not use ice for resting, reproduction, or rearing of young like pinnipeds.

It is not clear how governments and individuals will respond or how much of these future efforts will reduce greenhouse gas emissions. Although the intensity of climate changes will depend on how quickly and deeply humanity responds, the models predict that the climate changes observed in the past 30 years will continue at the same or increasing rates for at least 20 years. Although NMFS recognizes that climate change is a concern for the sustainability of the entire ecosystem in Cook Inlet, it is unclear at this time the full extent to which climate change will affect marine mammal species.

4.5.9. Conclusion

Based on the summation of activity in the area provided in this section, NMFS determined that the incremental impact of issuing an Authorization for one year for the proposed SAE seismic survey in Cook Inlet when added to the other past, present, and future activities would not be expected to result in a significant cumulative impact to the human environment. The potential impacts of issuing an Authorization on marine mammals, their habitats, and the human environment in general are expected to be minimal based on the limited and temporary noise footprint and mitigation and monitoring requirements of the Authorization.

Chapter 5 List of Preparers and Agencies Consulted

Agencies Consulted

No other persons or agencies were consulted in preparation of this EA.

Prepared By

Sara Young
Fishery Biologist
Permits and Conservation Division
Office of Protected Resources, NOAA/National Marine Fisheries Service

Chapter 6 Literature Cited

Aerts, L.A.M., and W.J. Richardson (editors). 2008. Monitoring of industrial sounds, seals, and bowhead whales near BP's Northstar Oil Development, Alaskan Beaufort Sea, 2007: Annual Summary Report. LGL Rep. 1005b. Rep. from LGL Alaska Res. Assoc. Inc. (Anchorage, AK), Greenridge Sciences Inc. (Santa Barbara, CA), and Applied Sociocultural Research (Anchorage, AK) for BP Exploration (Alaska) Inc., Anchorage AK.

Alaska Department of Commerce, Community, and Economic Development (ADCCE). 2010. Kenai Peninsula Borough, Alaska Community Database Community Information Summary. http://www.dced.state.ak.us/dca/commdb/CIS.cfm Accessed August 25, 2011.

Allen, B.M. and R.P. Angliss. 2013. Alaska Marine Mammal Stock Assessments, 2012. U.S. Department of commerce, NOAA Technical Memorandum. NMFS-AFSC-245, 282 p.

Angliss, R.P. and R.B. Outlaw. 2005. Alaska Marine Mammal Stock Assessments, 2004. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-AFSC-161, 250 p.

ASRC Energy Services. 2014a. Petition for Incidental Take Regulations for Seismic Program Cook Inlet, Alaska in 2015-2020. 276 pp. Available on the Internet at: http://www.nmfs.noaa.gov/pr/pdfs/permits/apache_loa_application2014.pdf.

ASRC Energy Services. 2014b. Biological Assessment Cook Inlet, Alaska. 254 pp.

Au, W.W.L. and P.W.B. Moore. 1988. Detection of complex echoes in noise by an echolocating dolphin. Journal of the Acoustical Society of America 83:662-668.

Au, W.W.L. and P.W.B. Moore. 1990. Critical ration and critical bandwidth for the Atlantic bottlenose dolpnin. Journal of the Acoustical Society of America 88:1635-1638.

Bain, D.E., and R. Williams. 2006. Long-range effects of airgun noise on marine mammals: Response as a function of received sound level and distance. SC/58/E35. 6 pp.

Blackwell, S.B. and C.R. Greene Jr. 2002. Acoustic measurements in Cook Inlet, Alaska during August 2001. Greeneridge Report 271-2. Report from Greeneridge Sciences, Inc., Santa Barbara for National Marine Fisheries Service, Anchorage, Alaska. 43 p.

Boveng, P., London, J., Ver Hoef, J., and R. Montgomery. Strong seasonal dynamics of harbor seals in Cook Inlet, Alaska.

Brueggeman, J.J., M. Smultea, K. Lomac-MacNair, D.J. Blatchford, and R. Dimmick. 2007a. 2007 fall marine mammal monitoring program for the Union Oil Company of California Granite Point seismic operations in Cook Inlet Alaska: 90-day report. Canyon Creek Consulting. Prepared for Union Oil Company of California. 34 pp.

Brueggeman, J.J., M. Smultea, H. Goldstein, S. McFarland, and D.J. Blatchford. 2007b. 2007 spring marine mammal monitoring program for the ConocoPhillips Beluga River seismic operations in Cook Inlet Alaska: 90-day report. Canyon Creek Consulting. Prepared for ConocoPhillips Alaska, Inc. 38 pp.

Brueggeman, J.J., M. Smultea, K. Lomac-MacNair, and D.J. Blatchford. 2008. 2007 fall marine mammal monitoring program for the Marathon Oil Company North Ninilchik seismic operations in Cook Inlet Alaska: 90-day Report. Prepared for Marathon Oil Company. 18 pp.

Bureau of Ocean Energy Management (BOEM). 2003. Cook Inlet Planning Area Oil and Gas Lease Sales 191 and 199. Final Environmental Impact Statement. Executive Summary and Sections I through IV. Alaska OCS Region.

Croll, D.A., C.W. Clark, J. Calambokidis, W.T. Ellison and B.R. Tershy. 2001. Effects of anthropogenic low-frequency noise on the foraging ecology of *Balaenoptera* whales. Animal Conservation. 4:13-27.

Dahlheim, M., A. York, R. Towell, J. Waite, and J. Breiwick. 2000. Harbor porpoise (*Phocoena phocoena*) abundance in Alaska: Bristol Bay to Southeast Alaska, 1991-1993. Marine Mammal Science 16:28-45.

Finneran, J. J., Schlundt, C. E., Carder, D. A., Clark, J. A., Young, J. A., Gaspin, J. B., and Ridgway, S. H. 2000. Auditory and behavioral responses of bottlenose dolphins (*Tursiops truncatus*) and a beluga whale (*Delphinapterus leucas*) to impulsive sounds resembling distant signatures of underwater explosions. Journal of the Acoustical Society of America 108:417 431.

Finneran, J.J., D.A. Carder, and S.H. Ridgeway. 2002. Low frequency acoustic pressure, velocity, and intensity thresholds in a bottlenose dolphin (*Tursiops truncatus*) and white whale (*Delphinapterus leucas*). Journal of the Acoustical Society of America 111:447-456.

Funk, D.W., R.J. Rodrigues, and M.T. Williams (eds.). 2005. Baseline studies of beluga whale habitat use in Knik Arm, Upper Cook Inlet, Alaska, July 2004-July 2005. Report from LGL Alaska Research Associates, Inc., Anchorage, Alaska, in association with HDR Alaska, Inc., Anchorage, AK, for Knik Arm Bridge and Toll Authority, Anchorage, Alaska, Department of Transportation and Public Facilities, Anchorage, AK, and Federal Highway Administration, Juneau, Alaska. December 9. 232 p.

Gales, R.S. 1982. Effects of noise of offshore oil and gas operations on marine mammals – an introductory assessment. NOSC TR 844, 2 vol. U.S. Naval Ocean Systems Center. San Diego, California. 300 p.

Gillespie D, Castellote M, Maginnis A, Garner CD and RJ Small (2013) Real time monitoring for beluga whales (Delphinapterus leucas) in the Eagle River, Alaska using a PAMBuoy® detection system. Final Contract Report by SMRU, LLC and Marine Instruments Ltd. 19p.

Harris, R.E., G.W. Miller, and W.J. Richardson. 2001. Seal responses to airgun sounds during summer seismic surveys in the Alaskan Beaufort Sea. Marine Mammal Science 17:795-812.

Hobbs, R.C., D. J. Rugh, and D. P. DeMaster. 2000. Abundance of belugas, *Delphinapterus leucas*, in Cook Inlet, Alaska, 1994-2000. Marine Fisheries Review 62:37-45.

Hobbs, R.C., K.L. Laidre, D.J. Vos, B.A. Mahoney, and M. Eagleton. 2005. Movements and area use of belugas, *Delphinapterus leucas*, in a subarctic estuary. Arctic 58(4):33 1-340.

Hobbs, R. C., K. E. W. Shelden, D. J. Rugh, and S. A. Norman. 2008. 2008 status review and extinction risk assessment of Cook Inlet belugas. AFSC Processed Report 2008-02, 116 p. Alaska Fisheries Science Center, NOAA, National Marine Fisheries Service. 7600 Sand Point Way NE, Seattle, WA 98115.

Hobbs, R.C., C.L. Sims, and K.E.W. Shelden. 2011. Estimated abundance of belugas in Cook Inlet, Alaska, from aeiral surveys conducted in June 2011. NMFS, NMML Unpublished Report. 7 p.

Huntington, H.P. 2000. Traditional knowledge of the ecology of belugas, *Delphinapterus leucas*, in Cook Inlet, Alaska. Marine Fisheries Review 62: 134- 140.

Ireland, D. S., D. W. Funk, T. M. Markowitz, and C. C. Kaplan. 2005. Beluga whale distribution and behavior in Eagle Bay and the Sixmile Area of Upper Cook Inlet, Alaska, in September and October 2005. Rep. from LGL Alaska Research Associates, Inc., Anchorage, Alaska, in association with HDR Alaska, Inc., Anchorage, Alaska, for the Knik Arm Bridge and Toll Authority, Anchorage, AK, Department of Transportation and Public Facilities, Anchorage, Alaska, and the Federal Highway Administration, Juneau, Alaska.

Jacobs, S.R., and J.M. Terhune. 2002. The effectiveness of acoustic harassment devices in the Bay of Fundy, Canada: seal reactions and a noise exposure model. Aquatic Mammals 28: 147-158.

Laidre, K.L., Shelden, K.E.W., Rugh, D.J., and Mahoney, B.A. 2000. Beluga, *Delphinapterus leucas*, distribution and survey effort in the Gulf of Alaska. Marine Fisheries Review 62:27-36.

Madsen, P.T., and B. Møhl. 2000. Sperm whales do not react to sounds from detonators. Journal of the Acousical Society of America 107:668-671.

Madsen, P.T., B. Møhl, B.K. Nielsen and M. Wahlberg. 2002. Male sperm whale behavior during exposures to distant seismic survey pulses. Aquatic Mammals 28(3):231-240.

Malme, C.I., B. Würsig, J.E. Bird and P. Tyack. 1986. Behavioral responses of gray whales to industrial noise: feeding observations and predictive modeling. BBN Report No. 6265. OCS Study MMS 88-0048. Outer Continental Shelf Environmental Assessment Progress, Final Report. Princ. Invest., NOAA, Anchorage 56(1988): 393-600. NTIS PB88-249008.

Markowitz, T.M., T.L McGuire, and D.M. Savarese. 2007. Monitoring beluga whale (*Delphinapterus leucas*) distribution and movements in Turnagain Arm along the Seward Highway. LGL Research Associates, Inc. Final Report from LGL Alaska Research Associates, Inc. Prepared for HDR, Inc. on behalf of the Alaska Department of Transportation and Public Facilities.

Miller, G.W., V.D. Moulton, R.A. Davis, M. Holst, P. Millman, A. MacGillivray, and D. Hannay. 2005. Monitoring seismic effects on marine mammals – southeastern Beaufort Sea, 2001-2002. In: S.L. Armsworthy, P.J. Crandfor, and K. Lee (eds), Offshore oil and gas environmental effects monitoring: approaches and technologies. Battelle Press, Columbus, OH.

Moore, S.E., K.E.W. Shelden, L.L. Litzky, B.A. Mahoney, and D.J. Rugh. 2000. Beluga, *Delphinapterus leucas*, habitat associations in Cook Inlet, Alaska. Marine Fisheries Review 62:60-80.

Moulton, V.D. and J.W. Lawson. 2002. Seals, 2001, In . In: W.J. Richardson (ed), Marine Mammal and Acoustical Monitoring of Western Geophysical's open water seismic program in the Alaskan Beaufort Sea. LGL rep TA2230-3 from LGL Ltd, King City, ON and Greeneridge Sciences Inc., Santa Barbara, CA. 390 p.

National Marine Fisheries Service (NMFS). 2000. Small takes of marine mammals incidental to specified activities; marine seismic-reflection data collection in southern California. Federal Register 65(20):16374-16379.

NMFS. 2003. Subsistence Harvest Management of Cook Inlet Beluga Whales Final Environmental Impact Statement. July.

NMFS 2007. Environmental Assessment on the Issuance of Incidental Harassment Authorization to ConocoPhilips Alaska, Inc. and Union Oil Company of California to Take Marine Mammals by Harassment Incidental to Conducting Seismic Operations in Northwestern Cook Inlet, Alaska.

NMFS. 2008a. Final Supplemental Environmental Impact Statement – Cook Inlet Beluga Whale Subsistence Harvest. Anchorage, Alaska. http://www.fakr.noaa.gov/protectedresources/whales/beluga/seis/default.htm

NMFS. 2008b. Final Conservation Plan for the Cook Inlet beluga whale (*Delphinapterus leucas*). National Marine Fisheries Service, Juneau, Alaska.

NMFS. 2008c. Recovery Plan for the Steller sea lion (*Eumatopia jubatus*). National Marine Fisheries Service, Juneau, Alaska.

NMFS. 2013a. Environmental Assessment for the Issuance of an Incidental Harassment Authorization for the Apache Alaska Corporation 3D Seismic Survey in Cook Inlet, Alaska, 2013.

NMFS. 2013b. Endangered Species Act: Section 7 Consultation Biological Opinion for 3D Seismic Surveys off Cook Inlet, Alaska by Apache Alaska Corporation. NMFS Alaska Regional Office.

NMFS. 2013c. Draft Guidance for Assessing the Effects of Anthropogenic Sounds on Marine Mammals: Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts. Draft: 23 December 2013. USDOC, NOAA, NMFS, Silver Spring, MD 83 pp. (Available at: http://www.nmfs.noaa.gov/pr/acoustics/draft_acoustic_guidance_2013.pdf)

National Marine Mammal Laboratory (NMML). 2004. Personal communication from Christy Sims, Marine Mammal Data Specialist. Regarding Opportinistic Marine Mammal Sightings (1999-2002) and beluga aerial survey data (1993-2004). Seattle, WA.

NMML. 2011. Personal communication from Manuel Castellote, Marine Mammal Acoustician. Regarding results of passive acoustic monitoring in Cook Inlet and harbor porpoise use of West Foreland Site. Seattle, WA. Teleconference with David Hannay, JASCO.

Ocean Renewable Power Company (ORPC). 2011. Cook Inlet Alaska ORPC Project. <http://www.oceanrenewablepower.com/ocgenproject_alaska.htm>. Accessed May 11, 2011.

PacRim Coal, L. 2011. Applicant's Proposed Project. April 2011. Current Project Description. <http://www.chuitnaseis.com/documents/Current-Project-Description.pdf>. Accessed May 11, 2010.

Parks, S.E., C.W. Clark and P.L. Tyack. 2007. Short- and long-term changes in right whale calling behavior: the potential effects of noise on acoustic communication. Journal of the Acoustical Society of America 122(6):3725-3731

Prevel Ramos, A.P., M.J. Nemeth, and A.M. Baker. 2008. Marine mammal monitoring at Ladd Landing in Upper Cook Inlet, Alaska, from July through October 2007. Final report prepared by LGL Alaska Research Associates, Inc., Anchorage, Alaska for DRven Corporation, Anchorage, Alaska.

Prevel Ramos, A.P., T.M. Markowitz, D.W. Funk, and M.R. Link. 2006. Monitoring beluga whales at the Port of Anchorage: Pre-expansion observations, August-November 2005. Report from LGL Alaska Research Associates, Inc., Anchorage, Alaska, for Integrated Concepts & Research Corporation, the Port of Anchorage, Alaska, and the waterfront Department of Transportation Maritime Administration.

Richardson, W.J., C.R. Greene, C.I. Malme, and D.H. Thomson. 1995a. Marine Mammals and Noise. Academic Press, Inc., San Diego, CA.

Richardson, W.J., C.R. Greene Jr., J.S. Hanna, W.R. Koski, G.W. Miller, N.J. Patenaude and M.A. Smultea, with R. Blaylock, R. Elliott and B. Würsig. 1995b. Acoustic effects of oil production activities on bowhead and white whales visible during spring migration near Pt. Barrow, Alaska – 1991 and 1994 phases. OCS Study MMS 95-0051; NTIS PB98-107667 .LGL Rep. TA954. Rep. from LGL Ltd., King City, Ont., for U.S. Minerals Manage. Serv., Herndon, VA. 539 p.

Richardson, W.J., C.R. Greene Jr., W.R. Koski. M.A. Smultea, G. Cameron, C. Holdsworth, et al. 1991. Acoustic effects of oil production activities on bowhead and white whales visible during spring migration near Pt. Barrow, Alaska – 1990 phase. OCS Study MMS 91-0037; NTIS PB92-170430. LGL Ltd. Report for U.S. Mineral Management Service, Herndon, VA. 311 pp.

Rugh, D.J., K.E.W. Shelden, and B. A. Mahoney. 2000. Distribution of belugas, *Delphinapterus leucas*, in Cook Inlet, Alaska, during June/July, 1993-2000. Marine Fisheries Review 62: 6-21.

Rugh, D.J., B.A. Mahoney, C.L. Sims, B.K. Smith, and R.C. Hobbs. 2003. Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2003. http://www.fakr.noaa.gov/protectedresources/whales/beluga/ surveyrpt2003.pdf.

Rugh, D.J., B.A. Mahoney, and B. K. Smith. 2004a. Aerial surveys of beluga whales in Cook Inlet, Alaska, between June 2001 and June 2002. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-AFSC-145.

Rugh, D.J., B.A. Mahoney, C.L. Sims, B.A. Mahoney, B.K. Smith, and R.C. Hobbs. 2004b. Aerial Surveys of Belugas in Cook Inlet, Alaska, June 2004. http://www.fakr.noaa.gov/protected resources/whales/beluga/survey/2004.pdf.

Rugh, D.J., K.E.W. Shelden, C.L. Sims, B.A. Mahoney, B.K. Smith, L.K. (Litzky) Hoberecht, and R.C. Hobbs. 2005a. Aerial surveys of belugas in Cook Inlet, Alaska, June 2001, 2002, 2003, and 2004. NOAA Technical Memorandum NMFS-AFSC-149. 71pp.

Rugh, D. J., K.T. Goetz, and B.A. Mahoney. 2005b. Aerial Surveys of Belugas in Cook Inlet, Alaska, August 2005. http://www.fakr.noaa.gov/protectedresources/whales/beluga/aerialsurvey05.pdf.

Rugh, D. J., K. T. Goetz, B. A. Mahoney, B. K. Smith, and T. A. Ruszkowski. 2005c. Aerial surveys of belugas in Cook Inlet, Alaska, June 2005. Unpublished Document. Natl. Mar. Mammal Lab., NMFS, NOAA, Alaska Fish. Sci. Cent., 7600 Sand Point Way, NE, Seattle, WA 98115. 17 p.

Rugh, D.J., K.T. Goetz, C.L. Sims, and B.K. Smith. 2006. Aerial surveys of belugas in Cook Inlet, Alaska, August 2006. Unpubl. NMFS report. 9 pp.

Rugh, D.J., K.T. Goetz, J.A. Mocklin, B.A. Mahoney, and B.K. Smith. 2007. Aerial surveys of belugas in Cook Inlet, Alaska, June 2007. Unpublished Document. NMFS report. 16 pp.

Rugh, D.J., K.E.W. Shelden, and R.C. Hobbs. 2010. Range contraction in a beluga whale population. Endangered Species Res. 12:69-75.

Shelden, K.E.W., D.J. Rugh, B.A. Mahoney, and M.E. Dahlheim. 2003. Killer Whale Predation on Belugas in Cook Inlet, Alaska: Implications for a Depleted Population. Marine Mammal Science 19(3):529-544.

Shelden, K.E., K.T. Goetz, L.V. Brattström, C.L. Sims, D.J. Rugh, and B.A. Mahoney. 2008. Aerial surveys of belugas in Cook Inlet, Alaska, June 2008. NMFS Report. 19 pp.

Shelden, K.E., K.T. Goetz, L.V. Brattström, C.L. Sims, D.J. Rugh, and R.C. Hobbs. 2009. Aerial surveys of belugas in Cook Inlet, Alaska, June 2009. NMFS Report. 19 pp.

Shelden, K.E., K.T. Goetz, L.V. Brattström, C.L. Sims, D.J. Rugh, and R.C. Hobbs. 2010. Aerial surveys of belugas in Cook Inlet, Alaska, June 2010. NMFS Report. 19 pp.

Shelden, K. E. W., C. L. Sims, L. Vate Brattström, K. T. Goetz, And R. C. Hobbs. 2015. Aerial surveys of beluga whales (*Delphinapterus leucas*) in Cook Inlet, Alaska, June 2014. AFSC Processed Rep. 2015-03, 55 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

Shelden, K.E., C.L. Sims, L.V. Brattström, J.A. Mocklin, and R.C. Hobbs. 2012. Aerial surveys of belugas in Cook Inlet, Alaska, June 2012. NMFS Report. 19 pp.

Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic Mammals, Special Issue 33.

Stone CJ, Tasker ML. 2006. The effects on seismic airguns on cetaceans in UK waters. J. Cetacean Res. Manage. 8(3):255-263.

Weir, C.R. 2008. Overt responses of humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), and Atlantic spotted dolphins (*Stenella frontalis*) to seismic exploration off Angola. Aquatic Mammals 34(1):71-83.